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ABSTRACT

The topic of the 123rd meeting of the Association of Research Libraries (ARL) is the information infrastructure. The ARL is seeking to influence the policies that will form the backbone of the emerging information infrastructure. The first session concentrated on government roles and initiatives and included the following papers: "Opening Remarks" (Susan K. Nutter); "Canadian Information Policy" (Jocelyn Ghent Mallett); "Developing the National Information Infrastructure (NII)" (Michael Nelson); and "North Carolina's Information Highway" (Jane Smith Patterson). The stakeholders in the emerging information infrastructure are examined in the papers in the second session: "Introduction" (Hiram Davis); "The Public Interest Community: The Social and Legal Costs of the Information Superhighway" (Sonia Jarvis); "The Computer Industry's Assessment of the NII" (Kenneth Kay); "The Telecommunications Industry's Cooperative Role in the National Information Infrastructure (NII)" (Thomas Spacek); and "How the Information Network will Affect the Research and Education Communities" (Paul Evan Peters). Finally, papers concerned with the issues and technology of the infrastructure are presented in the third session: "Introduction" (James Neal); "Convergence and Higher Education" (Richard Taylor); and "Technological Change and the Public Interest" (Frederick Weingarten). (JLB)

The Emerging Information Infrastructure: Players, Issues, Technology, and Strategies

Association of Research Libraries
Proceedings of the 123rd Meeting
Part I
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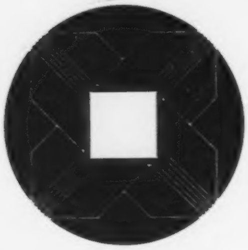

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THE EMERGING INFORMATION INFRASTRUCTURE: PLAYERS, ISSUES, TECHNOLOGY, AND STRATEGIES

ASSOCIATION OF RESEARCH LIBRARIES
PROCEEDINGS OF THE 123RD MEETING, PART I

ARLINGTON, VIRGINIA
OCTOBER 20-22, 1993

SUSAN K. NUTTER, PRESIDING

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THE EMERGING INFORMATION INFRASTRUCTURE: PLAYERS, ISSUES, TECHNOLOGY, AND STRATEGIES

Foreword

The headlines read "Internet fires revolution,"[1] and "Communications network eliminates time, distance between scientists."[2] While the press ballyhoos the social and economic implications of a global information network, an intense debate is taking place that will determine the shape and direction of this critical information and communication tool. Envisioned to be a highly integrated, interactive network that utilizes voice, data, image, or video, this "digital highway" will fundamentally change how the research and education communities conduct research and engage in scholarly endeavors in the years ahead. The Association of Research Libraries is taking a leadership role within the library, higher education, and public interest communities in seeking to influence the policies that will form the backbone of the emerging international information infrastructure.

This information infrastructure is seen as an instrument for economic development and as a means of improving quality-of-life services to the general population. Governments are grappling at the national and state levels with ways of balancing and safeguarding public and commercial interests. The first program session of the Association's 123rd Membership Meeting provided an overview of U.S. and Canadian government policy on the development of national information infrastructure. It also included a report on North Carolina's plans for the development of an ambitious communications network.

Decisions to be made over the next few years will highlight and exaggerate the differing needs and approaches of the various constituents involved in this debate. The second session provided an overview of the positions and policies of some of the other stakeholders. A panel of presenters provided insight into the perspectives of four key stakeholder groups: the telecommunications industry, the computer industry, the education community, and the public interest community.

The third program session focused on the convergence of policy issues and technology. Issues abound that are yet to be adequately addressed, such as protecting privacy, ensuring accessibility, encouraging commercial competition, and developing standards. At the same time, speed of technological innovation renders many questions moot almost at the moment that they are asked. Two presentations covered the key issues in these two arenas followed by a town meeting discussion of the implications for academic and research libraries.

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[1] *News & Observer*, Raleigh, NC, May 25, 1993

[2] *New York Times*, New York, NY, May 18, 1993

PROGRAM SESSION I

GOVERNMENT ROLES AND INITIATIVES

INTRODUCTION

Susan Nutter, ARL President
North Carolina State University

MS. NUTTER: I think it's safe to say that everyone in this room is aware that a communications revolution is underway that is as profound as the introduction of the printing press. This information revolution promises the creation of a worldwide resource with social and economic implications that have the capacity to alter dramatically the course of history and to change the way we live.

This resource, envisioned as an integrated, interactive visual audio and data superhighway, will change the way in which academic communities conduct research and scholarly endeavors in the future. For precisely this reason, it is imperative that we take an active part in shaping the decisions that will determine the fundamental characteristics of this international information infrastructure.

As public information institutions, libraries need to participate in the policy debate both as users and providers of services. The policy decisions made during the next few years will shape the communications system for decades. Many of the problems with formulating a policy for the information infrastructure come from the all-encompassing nature of such a global information market.

It has, at different times, been seen as an arena for the research and development community, a playground for the technologically advanced, and a supermarket in which the commercial sector can sell its wares.

The cable, telephone, utility, and entertainment industries are beginning to grapple with and define new roles and relationships in this evolving global communications landscape.

However, the more important issue tends to be obscured by the descriptions of the infrastructure's characteristics. The focus should be upon maximizing the public benefits and services possible from whatever shape the infrastructure assumes. The sessions that have been planned for this meeting are designed to stimulate discussion of the issues affecting research libraries and to aid us in developing a strategic agenda for the Association.

Program Session I, "Government Roles and Initiatives," will focus on the influence of U.S. and Canadian government policies on the development of national infrastructures and will include highlights from the state of North Carolina's plan for its communications network.

Program Session II, "The Players," will examine the stakes of the information game from the viewpoints of four very interested groups: the telecommunications and computer industries, the education community, and the public interest sector. We will see that, while each industry has its own agenda for the evolving infrastructure, there is some common vision for the future of the communication superhighway.

Program Session III, "Issues and Technology," will identify and address the policy and technology issues that control the developments taking place on the information landscape.

At this point, I'd like to open the session on government roles and initiatives. The governments of the United States and Canada are grappling with the decisions that need to be made in order to develop their visions for their nations' information infrastructure. The flexibility that makes this communications network so attractive also plays host to a myriad of very difficult questions, such as what capabilities the infrastructure should have; how much should its development cost and who should pay for that development; who should control it; and who should have access to it.

The steady deregulation of the telecommunications industry over the past decade highlights the difficulty in monopolistic government control of such a system. Of course, the state and federal governments, as well as the judicial system, reserve a certain amount of control as well. What is necessary is for the government to ensure the protection of the public interest while at the same time minimizing any barriers it might create to the infrastructure's evolution.

In the U.S., the current presidential agenda envisions a national information infrastructure as a seamless web of communications networks, computers, databases, and consumer electronics that will change forever how people live, work, and interact. This agenda also assumes that the government actions will complement and enhance the efforts of the private sector. As you can see, the Information Infrastructure Task Force, recently formed by the administration, is intended to play a major role in the development and application of information technologies and, as we all know from our own experiences, has its work cut out for it.

Our panel of distinguished speakers for this session will present an overview of the U.S. and Canadian government policy in the development of the national communications networks and introduce us to plans for North Carolina's information highway.

The panel includes Dr. Jocelyn Ghent Mallett of the Canadian Department of Industry, Science, and Technology; Michael Nelson of the U.S. Office of Science and Technology Policy; and Jane Smith Patterson of the Office of the Governor of North Carolina.

Our first speaker, Dr. Jocelyn Ghent Mallett, will present an overview of Canada's national policy. She is the Director General of the Information Technologies Industry Branch of the Canadian Department of Industry, Science, and Technology. She is responsible for developing and implementing Canada's industrial economic policy for the promotion of information technology. She has served on the Board of Directors of the International Space University and is a member of the Canadian Institute for International Affairs.

CANADIAN INFORMATION POLICY

Jocelyn Ghent Mallett
Department of Industry, Science, and Technology, Canada

DR. MALLETT: Good morning, everyone. I'd like to thank you, Susan, and also John Black for inviting me here to join you at your 123rd Annual Meeting of the Association of Research Libraries.

The government in Canada has just gone through a huge restructuring. My department is now called Industry and Science Canada. We are one of the partners in and supporters of Canada's National Information Highway -- CaNARIE (Canadian Network for the Advancement of Research, Industry and Education).

What follows is an examination of the policy issues that are encountered by any government involved in the planning and implementation of a national high-speed network, in our case CaNARIE, and a comparison of the way we dealt with those issues in Canada with the challenges and options that are facing policymakers and industry here in the United States.

It is my belief that as we all move forward in creating the networked society, we can benefit by first communicating with each other and by observing those lessons learned, often the hard way, by our counterparts in other countries. That form of networking, if you will, is my purpose today.

As part of its overall economic agenda and its industrial, communications, and computing policy objectives, the Canadian government supports the development and implementation of a high-speed national network as a natural and highly desirable goal. With the geographic challenge of a relatively small population -- only 27 million people -- strung out across an incredibly vast landmass, we need to foster a domestic capability for Canadian researchers, educators, and businesses to connect with each other and with Canadian supercomputers via a Canadian high-speed network.

We currently have a national framework of regional networks called CA*Net. CA*Net was initially funded by the National Research Council of Canada. Today it is largely used and maintained by researchers, academics, and educators, but not industry. But when my department, Industry and Science Canada, undertook to support the movement from today's CA*Net to a high-speed network, we decided from the very beginning that this initiative had to be industry led.

Why? One of Canada's challenges has long been the need to create better linkages between research and commercialization. In the past, Canada has been just superb in inventing new technologies while others carried on the full development and marketing. In order to get at a much more value-added economy, Canadians need to get better at taking our research to market. An initiative like CaNARIE is ideal for creating a stronger link between the research community and industry.

Although CaNARIE undoubtedly will benefit all Canadians by offering improved access to education, its primary purpose is to serve industry by providing an effective means for research and development (R&D) and information sharing. Therefore, only industry could accurately define the requirement for CaNARIE and then fulfill it.

Another very powerful reason for an industry-led approach is that our resources are limited. Canada carries one of the highest per capita public debt burdens in the world, and deficit reduction programs mean that the days of endless government funding for projects such as this are long gone, if, indeed, they were ever really here.

Finally, our telecommunications policy environment is very complex. In addition to the federal government, ten provincial governments play a role, and each is influenced by regional carriers. We are inclined, therefore, to go for cooperation and consensus. So we built an industry-led vision right into CaNARIE's basic mission statement: to form a partnership with the private sector to create competitive advantage for Canada.

To achieve this mission, a substantial consortium of members of the private sector, universities, libraries, research laboratories, regional networks, and the public sector at both federal and provincial levels came together as collaborators. Challenges to be overcome included cost, potential regulatory constraints, and issues associated with nurturing a complex, cooperative partnership among telecommunications carriers, equipment suppliers, academic users, and government departments.

The funding arrangements for CaNARIE reflect the fact that CaNARIE cannot actually go forward without industry leadership. This past June, we initialed a contribution agreement with CaNARIE, Incorporated, under which the federal government will contribute $26 million and the private sector, $90 million, toward Phase I of CaNARIE.

CaNARIE, Incorporated, has a fifteen-member Board of Directors, comprising seven industrial and seven institutional members and a chair. The institutional members are mainly university and research center directors. Our board also reflects the partnership being fostered between researchers and industry. Just this past week, the board selected a new full-time president of CaNARIE, Professor Andrew Bjerring of the University of Western Ontario. Andy has been instrumental in working with the library, education, and research communities to grow CA*Net and develop CaNARIE, and he is ideally positioned to oversee the transition of this vital infrastructure from the hands of academe to industry.

We do have an ambitious plan for our national network. By the end of Phase I, in mid-1995, CaNARIE will have upgraded CA*Net, established fiber optic test networks, and completed $40 million worth of R&D on new network products, applications, and services.

Subsequent phases will see the expansion of the test in operational networks, and eventually the establishment of an integrated national gigabit-speed network, a network that will allow Canada to at least keep pace with global competition and that will cost something in the neighborhood of a billion dollars.

Some might feel that it's unrealistic to expect industry to lead and provide the lion's share of funding for something for which the market may as yet be unproven. Others might also wonder whether companies within a highly competitive industry sector such as telecommunications will be able to work together in a consortium approach. But our experiences to date in Canada have dispelled these concerns. In fact, I believe that CaNARIE itself is a good example of the type of partnership that industry and the public sector must build in order to create the kind of technological infrastructure needed in the information age.

Canada's major carrier, Stentor, formerly known as Bell, and its foremost competitor, Unitel, are hardly firms you would expect to find in an alliance. They are currently waging a fierce market battle for the long-distance market, but they're together in this: both are strong, cooperative partners in CaNARIE, Incorporated. They are combining their strengths in order to move forward a venture that will have strong benefits for both organizations.

What we hope to do is to establish not only an information network but also a human network of people who are interested in this form of technology and can make it happen at arm's length from government. The real direction and driving energy comes from the private sector. Industry is working in partnership with us to respond to its own requirements for advanced research and information sharing, and for the development and marketing of the new products and services that will drive the economy in the next century.

Now let me do a little comparing with the United States. The United States is ahead of Canada technologically. NSFNet is already at speeds at which our upgrade of CaNARIE is only aiming. The United States is also ahead of us on the regulatory front, which surely shows up in the much lower pricing structure that you have; and you're also ahead of us, I think, in the very broad-based acceptance of networking. E-mail addresses are now as common a feature of corporate and academic life as fax numbers. I'm sure they appear on the business cards of everyone in this room.

Networking in the United States, in my perception, has evolved beyond being an intellectual or a technical curiosity and is now a staple of academic and professional life. This is not yet true in Canada.

The U.S. approach to policy in this area is also very different. Since the establishment of a national information highway is seen as a public good, the American government is providing strong leadership and substantial funding. The budget numbers that underlie the United States High Performance Computing and Communications Act for fiscal years (FY) 1993 and 1994 are a very impressive commitment by anyone's standards.

Now, the overall goal of U.S. information policy as I understand it is to create a data network like the telephone network: cheap, stable, and accessible. Policy issues include how to make federal data broadly available, privacy issues, security, intellectual property, and so on.

Mike Nelson, my colleague here today, has introduced the national information infrastructure (NII) as an initiative designed to allow any person to communicate any information to any place at a quality of service and price acceptable to the user. The U.S. government commitment to universal access also might seem, however, to beg the question of how to ensure interconnection and access among the many competitive private sector or commercial networks that may emerge over time.

Can competition be allowed and universal access still be guaranteed? Can the U.S. regulatory environment permit multiple networks to flourish? This is a major policy issue that will have to be resolved, not just in the United States but in Canada as well. An important difference between U.S. and Canadian policy is the stronger U.S. commitment to applications development. Approximately two out of every three dollars being spent on the High-Performance Computing Communications (HPCC) initiative is in applications, and much of the planning focuses on how to use the expanding capacity for the grand challenges such as energy and the environment.

In Canada, this thoughtfulness and forward planning around applications has not yet reached maturity, and there is far less commitment on the government side to working out the specific new thrusts. In the United States, unlike in Canada or Europe, gigabit networks are on the political agenda. The high-performance computing community has mobilized support to maintain the U.S. lead in supercomputing, raising the specter of foreign competition.

Up north, on the other hand, in the closing days of a recent national election campaign, not a single politician even once mentioned this key tool of our vision for the future.

A final difference I would mention is the debate that did not take place in Canada on whether the national superhighway should be built and controlled by government or industry. Whether the U.S. government should be providing backbone services or merely support for access and enhanced network features continues to be a policy issue here.

So Canadian and U.S. policy approaches have been substantially different. But what, then, might the U.S. policymakers find most interesting about the Canadian experience? First and foremost, I believe that for long-term success it is essential that any major government initiative have the major stakeholders, whether they are in education or research or industry, on board from day one. No government, in these times of record deficits, can afford to set up competing systems. In Canada, we just don't have the money for that. We had to find another way: partnerships.

We also can't afford to have many different national systems going at the same time. So rather than separate an experimental network from an operational network, we keep them all under the same umbrella, fostering increased synergy between the two spheres of influence.

The other lesson we learned in setting up CaNARIE is how to get fractious parties to sit down together at one table. Under Canada's federal system, our provincial governments are highly independent, and they have exclusive control over education. By involving them in the creation of a national high-speed network, we were able to put the E in CaNARIE. Many observers have asked me how we managed to gain their cooperation, in addition to combining public and private sector interests.

The answer is really quite straightforward; we had to create a win-win situation for all concerned. The federal government supports the background and benefits by fostering the growth of cross-country communication. The provinces contribute regional network funding, and they benefit by controlling the speed and the sophistication at which they come on line; and the private sector contributes the lion's share of the investment, and it benefits with enhanced industrial capability.

This consensus-driven approach also prevents overlap and unnecessary duplication among the different levels of government as well as between the public and the private sectors.

What can we in Canada learn from developments in the United States to date? I applaud the drive, the energy, and the vision that has been so clearly articulated by Vice President Gore. I envy the attention that this issue has gotten from the president of the United States and his public and vocal support for this initiative. I covet the public awareness that has resulted from this executive outspokenness. Because we don't have that atmosphere, average Canadians do not understand how the creation of a national highway is to their advantage, or how it affects their children's future.

The U.S. commitment to using networks to serve the public interest also gives me food for thought in comparing the Canadian situation. While it is part of my personal vision that CaNARIE will be available to and of benefit to every citizen, if you look at our formal policy to date, we have not made the strong commitment to that vision that the U.S. policymakers have. Our network serves researchers and educators today and business and commercial interests in the immediate, foreseen future.

Since we want the private sector to continue to lead this effort, we have to take a certain leap of faith in assuming that it will be in industry's best interest to develop and market inexpensive applications that will serve all Canadians as consumers.

I believe the push for universal access will come from the grass roots. Eventually, everyone wants to be involved in networking.

There is perhaps an historical paradox developing, as the United States and Canada pursue their national network strategies. Canada has long been known as the place where government has provided strong leadership in technology development, particularly in telecommunications and the satellite systems: cable TV, broadcasting, and videotext.

Now we in Canada want to move away from that role and spur industry to lead. Conversely, the U.S. government has been reluctant to involve itself in technology support, except with respect to space and defense; and now in the development of the national information infrastructure, the United States is playing a much stronger role than it ever has before.

Nonetheless, in the long term, our policy courses will merge, as every major Western economy continues to restructure. We both have to meet the challenge of the information revolution, and it's changing the world. Whatever support governments can possibly afford to give increasingly will need to be thrown into the sectors with the greatest future potential for jobs and for growth.

In conclusion, the United States may choose to stay its course of government leadership and control of the information superhighway, and Canada's industry-led approach is just under way, with no conclusive results in hand. Either way, the policy environment with respect to national networks is sure to remain contentious. There are a number of key issues that policymakers have not really addressed, either in the United States or in Canada.

As these networks evolve and usage and bandwidth increase, public access is becoming one of the most important issues. In Canada, we will not have broad public access unless we either subsidize users or otherwise drive down the price of data transmission. This may not be the case in the United States, where long-distance charges are five to six times lower than they are in Canada.

If networks are subsidized by taxpayers, then their interests must be protected in some fashion. Broad public access might make these networks ungovernable and will challenge public notions of free speech, property rights, privacy, security, and citizenship. And unless the technology is easy to use, it's a barrier to broader usage among the general population. Without broad public awareness and training, the average person may find networks and their technology remote, threatening, and disempowering.

In the very near future, citizens without access to these networks might be considered disenfranchised. How will any of us tie together the different networks that emerge? How will we provide interconnectivity? Of special interest here today, perhaps, is how big a part will government play in pushing research networks to become commercial networks?

At the Internet conference in August, keynote speaker Robert Metcalf of Infoworld accused Internet of being a pampered elite and predicted it would become a dinosaur unless it moved closer to market-based policy. Perhaps it's time, then, for government to challenge the research community to reach out to industry and find ways to work together. This is certainly what I hope Dr. Bjerring, the new CaNARIE president, will do in linking his own research network background with his industry-led board of directors.

How we deal with these issues will determine in large measure the long-term success or failure of the kind of massive infrastructure projects that CaNARIE, Internet, and the National Research and Education Network (NREN) represent, and it will also say much about how we as nations feel about our social and economic development policies. There are no easy answers. But I, for one, am looking forward to continuing the U.S.-Canada dialogue as we move into the next millennium.

MS. NUTTER: Michael Nelson, our next speaker, has worked with Vice President Gore for more than five years on a variety of science and technology issues. As a staff member of the Senate Commerce Committee, he was assigned to the Science subcommittee chaired by then-Senator Gore and was responsible for issues ranging from computer technology to earthquake research to biotechnology. He was a lead Senate staffer on then-Senator Gore's high-performance computing legislation and other related information technology bills.

Mike has a B.S. in geology from Cal Tech and a Ph.D. in geophysics from M.I.T. When Vice President Gore moved from the Senate to the White House, Mike Nelson followed, and he is now at the White House Office of Science and Technology Policy, where he continues to work on a range of issues, including information technology and information policy.

DEVELOPING THE NATIONAL INFORMATION INFRASTRUCTURE

Michael Nelson
U.S. Office of Science and Technology Policy

DR. NELSON: Thank you very much for that introduction, Susan. It may seem kind of odd that a geophysicist or a geologist is involved in all this, but actually it makes a lot of sense when you think about it. Right now we're in the midst of a technological earthquake, and I feel very well trained to try to figure out what's going on.

The national information infrastructure has been one of the top priorities of this administration. Even before we came into office, through the campaign, we stressed the importance of building information highways, of making information more available to the American people, of casting a vote for competitiveness, for education, for health care, and for government.

Let me quickly outline my topic here. I will start by trying to define what the information infrastructure is, then talk about the government's role, and then specify what different initiatives we have under way.

It's really hard to know what the information infrastructure is going to look like. Technology is moving so quickly, the market structure is changing, and it's difficult to determine what our information and telecommunications networks will look like in even five years.

So we try to use a very simple, functional definition; and that is, "The NII is a system designed to deliver to all Americans the information they need when they want it and where they want it for an affordable price." That doesn't say anything about what technologies will be used, it doesn't say anything about which companies will provide the service, it doesn't even say anything about what Americans are going to want. But it's a working definition; it's one that can help us communicate to the American people what this is really about.

There are many reasons we want to build the NII, but the fundamental goal is listed in the definition. We want to build a system that can transmit imagery and video as easily as the telephone system transmits voice today. We want a system that's as easy to use, as ubiquitous, and as affordable.

What are the components of the national information infrastructure? First, it consists of thousands of different interconnected, interoperable communications networks. These networks aren't just fiber optic networks or telephone networks; they include satellite networks, wireless, and a whole panoply of technologies, all interlinked so that you can use your cellular telephone to talk to your television or your computer and vice versa.

Second, it consists of computer systems, televisions, telephones, fax machines, and all sorts of "information appliances," some of which are just now being invented in the lab.

Third, and perhaps most important, is the information itself that's going to be conveyed over this information infrastructure. The information includes databases, digital libraries, and all types of information services.

Last, it includes the people who build, maintain, and use the system — people who can help people throughout the country understand how the system works and how they can use it.

We have an information infrastructure today. We have TV, telephone, cellular, and radio networks. So what is it that is different? What do we need to get from where we are today to this national information infrastructure?

First off, we need interoperability. We need a way to make sure that all these networks do work together, that they're all interconnected, that you can use your telephone to get to your computer or to your television, and that we don't end up with dozens of different, disconnected, separate networks using different technologies and different protocols.

We also need much more bandwidth, particularly in the local network. To convey video as we convey voice today, it will take 100 or 1,000 times more bits per second. To make that happen, we're going to need massive private sector investment. The federal government is not going to build this network; we're not in the business of running phone systems, we're not in the business of running TV networks, and we certainly don't have the hundreds of billions of dollars needed to lay new fiber, put in new switches, and build computer systems to make all this possible.

We also need new applications, new software, and new computer systems to take all the data that's flying around this network and make it usable for people.

What's all this good for? NII is going to be an essential tool for education, allowing teachers and students to have access to resources they can't even imagine having today. It's going to make available digital libraries with huge collections of databases, containing the equivalent of millions of books, all accessible online, all searchable with software, all much easier to get at than information in paper form.

It's going to allow small and medium-sized businesses to get access to their customers, to share electronic blueprints, to get information on new technologies and new ways of doing business. It's going to provide video on demand so that we will not be going to video stores very much any more; we'll just be dialing up and having access to tens of thousands or even hundreds of thousands of movies, TV programs, or whatever we wish.

Health care is another key application, one the administration is very excited about. To allow doctors to do telemedicine will mean they can do house calls again, electronically rather than in person.

Shopping at home is something we're already starting to see, but in the future we'll have much, much more variety and much more interactivity. We'll have the ability to throw away the catalogs and interact directly with various stores and businesses around the country.

And last, government services. This administration is committed to using the NII to deliver better services to the citizen. This service can include access to government information, it can include electronic tax filing, and it can include the ability to communicate with people in government more effectively. Anybody who has ever tried to find the right person to talk to about a particular issue in government knows how difficult that can be and knows that there must be a better way. We think there is; it's called the NII.

So what is the government's role? As outlined in our February technology policy paper, there are four main roles. First, research and development, a traditional role of government and one that we invest a great deal of money in, and one that has paid off with some very handsome returns.

Second is demonstration projects. Helping to provide a little bit of seed money so that schools, libraries, hospitals, and state and local governments around the country can explore what this technology can do for them. Without that seed money, a lot of these institutions wouldn't be able to get online; they wouldn't be able to see what this is all about, and we wouldn't be able to demonstrate to them and to the nation how the information infrastructure can improve the way they do business.

Third, the government can be a customer for the NII. To date, we haven't done a very good job of that; we tend to buy two- or three-year-old technology, and we don't use it very well. So we're going to change that.

Last, the federal government can do a great deal by adopting forward-looking telecommunications and information policies that will promote the use of the NII. In many cases, we're dealing with 1950s regulations that are standing in the way of 1990s technology, and that needs to change.

Let me quickly go through each of these four areas and show what we're doing, and talk a little bit about how it relates to the library community. First, in the area of research and development, we have the High-Performance Computing and Communications Program, which the Vice President created about three years ago when he was in the Congress. This is now an $800 million program, and for FY 94 we've gotten just over a billion dollars to fund the development of new, more advanced supercomputers, better software, and faster networks, and to train people to use all this technology.

This program started as an effort to create new technologies — leading-edge technologies that were primarily useful for the research community. The supercomputers, the high-speed networks, and the advanced software were primarily used by scientists and engineers at our universities or federal labs, and in industry.

A lot of the technology that resulted was very hard to use; it helped if you had a Ph.D. in computer science; it wasn't user-friendly. But it was very useful; the research community has done a great deal with it, from modeling global climate change to designing new drugs to designing better aircraft. But it wasn't ready for prime time; it wasn't ready for the market.

So this year the Clinton administration proposed a new initiative, the Information Infrastructure Technology and Applications Program. The first year we requested $96 million and have gotten much of that from Congress.

The idea of this program is to take the core technology coming out of the HPCC program and make it more user-friendly; find ways to use it in industry, find ways to use it in libraries, in hospitals, and in schools around the country. And I think we're going to see some very, very good results, since we're basically leveraging the billion-dollar investment that's being made in the HPCC program and finding applications in other areas.

There are some very exciting things going on, particularly in the area of digital libraries. The National Aeronautics and Space Administration (NASA) has a key role to play as one of the largest generators of data. It has a real incentive to develop new ways to store, catalog, browse, and sort through information. And it's working very hard at developing some of the underlying technologies that will be needed to do things like put the Library of Congress online.

We're talking about some major technological challenges. We need to be working on them today, and this program is the first step in that direction. In the coming years, we'll be spending even more money in this area, and I think you'll see some very, very exciting results.

The second area I mentioned is pilot programs. There are a number of areas where the private sector will not invest in the technology and will not invest to see it put to use. This is particularly true for schools, where there aren't many extra dollars. There's not a lot of money for schools to get online to explore the technology. That's also true for libraries.

For this reason, we've started a new program. The official name is the Information Infrastructure Grant Program. I call it the "information highway on-ramp program." The idea here is to help schools, libraries, and hospitals build that last-mile connection into the network. Get the computers, get the modems, and get the switches so that they can discover what's out there.

In many cases, these schools have the money to pay a phone bill once they have the equipment to get online. So we're providing matching grants, starting in this fiscal year. We requested $54 million; it looks like Congress will give us about $30 million, which will allow us to provide a lot of small grants throughout the country to enable schools and libraries and others to get online.

The program will grow to over $100 million in the coming years. When we combine that with matching grants from states and the private sector, we hope to make sure that every school in the country has a computer that's connected to the Internet, so that every child has access and every teacher knows what kind of databases are available on the Internet.

In many cases, this computer will sit in a school library. The school librarian is the one who uses it and shows others how to use it, provides access, and helps teachers and students get to all the different resources available on the Internet.

The third area, government services, is an area the Vice President is particularly excited about. On September 7, he released the National Performance Review created by the task force on reinventing government. One of the most important chapters in that package was on information technology. Information technology can radically change the way we provide government services. In many cases, the productivity of government workers can improve by 50 or even 100 percent if we apply information technology properly, if we change our management structure and take better advantage of the technology.

This means not just networking, but also databases and computer processing. The key component of our effort here is to provide better access to information. The Vice President is fond of talking about how our information policy has been a little bit like our agriculture policy in the past, with silos of rotting grain and starvation everywhere. Now we have silos of rotting federal data and ignorance everywhere.

With proper use of information technology and proper policies, I think we can change that. There are billions of dollars' worth of federal data out there that often are being used by just a handful of people because no one knows it's there and it's very hard to get to. In many cases it's available electronically; it's on magnetic tape or it's even sitting in a computer database. It's just that we don't have access to any of that data.

There are lots of other different services we hope to explore. Electronic tax filing is something we want to encourage more of. There are many other electronic services that we will be providing. We are already making all the White House press releases, all of our speeches, and all of our important reports available electronically. A lot of you have probably downloaded the NII agenda document that we released in the middle of September. I know people in Singapore and Argentina and elsewhere downloaded it, because they're sending me e-mail. This is an area where we really can make a big difference.

One of the key pieces will be reforming procurement; right now it's impossible for most agencies to buy a computer system in less than two or three years, which means they're buying technology that's at least one, and probably two, generations old.

The fourth and probably most contentious area is the area of telecommunications and information policy. As I mentioned, we've got a lot of outdated regulatory policies. We've seen that technology is moving forward very quickly and yet our regulations are still back in the fifties and sixties. A lot of the regulations were created when they had copper telephone wires, and the only thing you could do with a telephone was to have a voice conversation. Well, data is now 50 percent of the traffic on the telephone network, and fiber optics are everywhere.

We also are seeing a convergence of technology. As everybody goes digital, we're seeing the phone companies and cable companies using the same digital technology. Yet, we have regulations that treat them very differently. So we have to start taking a careful look at how we can reconcile these differences, how we can get some of the regulations out of the way to spur investment and to spur competition in the marketplace so that all Americans will have more choice, more services, and better prices.

How are we going to do that? The White House has created an Information Infrastructure Task Force. We've got a lot of committees and subcommittees of this group that have been busy laying the groundwork, helping put out a framework for where we're going. This task force consists of the secretaries and deputy secretaries of most of the major agencies involved in telecommunications and information policy. They're being brought together by the Office of Science and Technology Policy (OSTP) and the National Economic Council. Ron Brown, the Secretary of Commerce, will chair the activity. He is very committed to making the NII a reality.

This group is going to map out a vision of where the NII is going and then figure out the regulatory and budgetary hurdles that stand in the way. This is a different approach. In the past, there were usually four or five different telecommunications policies and information policies because four or five different agencies had roles to play. Now we're getting all the key players together so we can get a coherent, forward-looking vision of what the NII can be and we can address the issues that need to be addressed in a comprehensive way.

So far, we've set up three different committees of the task force. The first one is on telecommunications policy, chaired by Larry Irving at the National Telecommunications and Information Administration (NTIA), Department of Commerce. We've got two working groups underneath that committee; one of them is on international telecom policy, the other one is on universal access. How can we ensure, as we move into this newly competitive environment with new technologies and new services, that all Americans continue to have easy access to at least basic services in the information infrastructure?

The second group is the information policy committee, chaired by Sally Katzen, head of the Office of Information and Regulatory Affairs at the Office of Management and Budget. They're taking on some of the thorniest issues that we face: issues like how to protect people's privacy when data is available in databases around the country, whizzing around at the speed of light. The second issue is how we protect intellectual property rights. That's a key issue when a person can sit at a desk, pull down somebody else's document, make a thousand copies of it, and send it out to a thousand people. High-tech plagiarism; how do you protect information in that environment?

These two issues combined are probably the showstopper issues. If we don't address them properly, people won't feel comfortable using the NII. Would you talk to your doctor if you knew that your discussion might not be private? So these are issues that we need to face.

The third issue, also very important, is how do we make government information more available -- what kind of pricing structure do we use, what kind of mechanisms do we use, how can we spend a little bit of money here and there throughout the government to make information more widely available?

The last group is the applications committee, chaired by Arati Prabhakar of the National Institutes of Standards and Technology. This group is looking at how we can use the technology within government to improve government services. We set up a government information technology services working group for that purpose. They're also looking at how to promote use of this technology in the private sector and in the public sector outside of government by adopting better, forward-looking policies.

One particular example I'd like to use is in the area of health care, where today there's some great technology for telemedicine. A doctor can sit and talk by videoconference, with a patient and look in detail at a particular wound that needs to be treated. The only problem with the technology is that the doctor can't get reimbursed for using it under most insurance programs and under most federal programs. So we've got to do something about that.

In the area of education there are lots of other examples of policies that could be changed to promote the more rapid deployment and widespread use of technology.

Things are moving quite quickly. The Information Infrastructure Task Force (IITF) is already formulating policy on a number of the key issues. Anybody who reads the newspapers knows that industry is certainly moving forward with major new investments and major mergers to promote the deployment of the information infrastructure. This administration wants to make sure that we have intelligent policies in place — that we get rid of some of the unnecessary regulations so that the private sector will get out there and invest.

We'll also want to make sure of a few other things: (1) that all Americans enjoy the benefits of this technology, and (2) that there is competition and choice in the marketplace. Those are key roles for the government to play, and we will continue to regulate the industry to make sure that those goals are accomplished.

For a week or so last fall, the comic strip character Doonesbury was online, exploring the Internet. I think we've really arrived. It's really a good symbol of what this network is all about and how widespread the knowledge of the NII is and how widespread the excitement is.

This is due, in part, to the fact that the administration has made the NII a key priority. We really have gotten out front and said, "This is important. We want to make it happen." We want to join with industry, the private sector, and all the stakeholders and really work on this problem. Because we think it is essential to the creation of new jobs in the twenty-first century; we think it's essential for provision of better government services, for providing information to all Americans, for providing better health care and education.

We are providing the leadership; it's kind of interesting to note that leadership is cheap. We don't have a lot of money to do all the things we'd like to do, but we do what we can with the money we have; and one of the things we do is we provide leadership.

Libraries have a key role in all of this. The library community early on realized the potential of this technology, and we've been working with the library community for more than five or six years to build momentum, to flesh out ideas, and to identify where there need to be changes in our plans.

The library community has been realizing that this is going to mean some fundamental changes in the way they do business. All the new applications, all the new ways to access information are going to present some new opportunities but also some real challenges, as people have to change the way they do business, as well as reallocate budgets when there's no new money around.

So we hope to work with you as you go through that, and we're glad to see that some of those things are already under way.

I also think this community has played a key role in educating the public; helping people understand what electronic information can do for them, what networks will be able to provide them with in the future. A very important part of that is an educated Congress. I've worked very closely with Prue Adler, Carol Henderson, and others here in Washington to get the word out to Congress, to explain to them that digital libraries are going to provide incredible amounts of information and services to voters around the country.

I am very glad to say that the library community has taken the big view. A lot of people involved in this have looked at it from the perspective of, "Well, what does this do for me directly?" The library community has taken a bigger view. They understand the benefits that will be provided to their community, but they also understand the big picture. And so often, they've lobbied for things that don't directly benefit this community but will benefit and promote the development of the NII.

So I'd like to thank you for your support in this, and as I said, I look forward to working with you in the future as we move out and make this a reality.

MS. NUTTER: Our next speaker, Jane Smith Patterson, is the chief advisor to the governor of North Carolina for budget, policy, and technology, and is responsible for the development of technology policy and deployment strategies within the state. She's a member of the science and technology policy group for the National Governors Association. As secretary of administration for the state of North Carolina she led the way in advancing the state uses of new technologies and laid the groundwork for the information superhighway. In addition, she has previously served as vice president of ITT's telephone switch division and as vice chancellor of the University of North Carolina at Wilmington.

My personal opinion, and she'll probably deny this — maybe she won't —, is that she is the chief architect of the vision for the North Carolina information highway. And I will venture a guess that she, like a number of people in this room, had to have been influenced by the opportunity to be a member of the library staff at the Wilson Library of the University of North Carolina at Chapel Hill.

NORTH CAROLINA'S INFORMATION HIGHWAY

Jane Smith Patterson
State of North Carolina

MS. PATTERSON: Thank you and good morning.

First of all, let me start this morning with a thought I have on something Dr. Mallett said, and that is that she referred to Infoworld. We shouldn't always depend on Infoworld, because back in 1985 they made a statement in one of their releases that, "everyone who wants a computer already has one."

I would also say that you're asking whether this technology is coming. You can look at Western Union back in 1877 when they sent a memo out saying that they expected that eventually every city will have at least one telephone.

It was also true that television was predicted never to work in the United States; it would merely be a toy. And the final thing I'll say before getting into my talk about North Carolina is, I myself also would like to commend our U.S. government and particularly Vice President Gore for the tremendous leadership that he has shown in the whole area of the national information infrastructure. If you go back and read the books in the library that you have under your control, you will find that there is historical evidence in America of a tremendous federal investment to develop infrastructure in this country, as in the canal system or when we laid the railroads. So I think that it is critical that our government remain right in the middle of the development of the national information infrastructure.

The North Carolina Information Highway is in fact the first statewide ATM SONET backbone to be deployed in the world. It was announced in May of this year and it will be operational in June of 1994.

Governor Hunt made the initial announcement about the first broadband statewide network. It is using ATM SONET technology. In fact, we developed the first state digital highway back in 1984, and at that time also created Concert Network, which is a public-private effort that operates out of the Microelectronics Center in North Carolina. Concert Network now connects about thirty-five sites across the state, basically research institutes and universities, and some private companies.

What has driven our development of this network are applications. Our pilot projects have been Vision Carolina, which are on the coast of North Carolina and Mecklenberg County, in which we have about seventeen sites tying together universities, community colleges, public schools, and hospitals. That network has been operating now for three years. We also have VistaNet, which is an ATM SONET test bed tying the University Medical School at Chapel Hill to the MCNC (Medical College of North Carolina) supercomputer, using the supercomputer to actually model about 6,000 different potential sitings of x-ray beams on a patient in a matter of six seconds. This wouldn't be possible without that supercomputer, and it really is a great advance for us in medicine as well as a cost savings.

All of our hardened criminals who are in for life and those on death row receive their medical treatment from our East Carolina University Medical School, straight over the Concert network. We have developed medical appliances, digital stethoscopes, to use over the network, with heartbeats just as good as you can hear standing in the same room.

I might add that in dermatology, it's a lot better over the highway than in person.

We also have an ISDN network at Appalachian State University that will be converting over to the ATM SONET highway.

We have a public-private partnership with the state of North Carolina and Bell South (Carolina Telephone, Sprint, and GTE). Let me tell you, it is possible for telephone companies to work together. We have twenty-nine in North Carolina. As a result of Judge Green's MFJ (modified final judgment) on breaking up the phone companies, our state has seven LATAs (local access transport areas) in it; in fact, we have some areas in our state within

LATAs in other states. Therefore, we have serious problems when it comes to trying to integrate or cross all the telephone companies' LATAs, and we have been able to do that.

They are providing the investment for this; we estimate that they are putting out at least $200 million in switches as well as close to a billion dollars in enhancements to the network over the next year and a half. So we have major private investment in North Carolina being driven by state telecommunications policy.

Our first-phase implementation is a controlled introduction the first fifteen months, working with about a hundred sites. We have identified 3,400 sites and every library in the state is in one of those sites, including public libraries and university libraries. In Phase II, we will begin an integration of voice and data in other locations on that network.

We also have a pilot project operating this year called School Tech in which we are bringing schools onto the Internet in a pilot network. We also have, with Motorola, a pilot for wireless communications transmitting onto our ATM SONET highway. So we're really moving ahead with all of the various applications out there.

We will be able to actually have on the ATM SONET highway the dial-up capability to do multimedia, data, video, audio, and graphics. All of that will be available within a full year of its introduction.

Like the vice president and the president and their concern about reinventing government, we see that as critical. We feel that a government that serves the people by working effectively and costing less is our mission in North Carolina. In fact, driving our whole information highway is our own theme that talks about reinventing government and the various ways we plan to do it using the information highway with the common components in the center and the infrastructure and the technical architecture in a circle, providing us productivity increases, cost reductions, service orientation, quality commitment, business process, reengineering, right-sizing, and organizational restructuring.

We have an Information Resources Management Commission (IRMC), developed back in the last administration, that now has major authority across all telecommunications policy in North Carolina. We can look at purchasing, we can look at actual architecture, and we have to have sign-off on the technical architecture at the state level, which includes universities.

For example, we required the phone companies to have a verificational laboratory to ensure interoperability testing of equipment. We want to be sure nothing will go on this network without our knowing it's going to work because at the State level, redundancy and reliability are critical to us. We have applications testing and demos — all will be done at the Advanced Networking Computer Center in the Microelectronics Center.

We believe in a distributed information policy rather than central. We look at agency versus organization specific, and we have lots of contact lists that we work with across all these various agencies. We have a migration planning policy for every network that's standing out there, so that ultimately every network in North Carolina will operate off our ATM SONET highway. It's basically a series of highways, some running at different speeds.

We have reached out in our committee structure to really involve as many people as possible. At the top is the governor, the general assembly, and the IRMC. One side is the operations work group, which is chaired by Al Blatecky. He is the head of the whole advanced networking area at the Microelectronic Center; it's a public-private organization.

On the application side is the vice chancellor at the University of Appalachia and Appalachian State, Dr. Jim Strom.

Going across the bottom we have the Geographic Information System (GIS) Economic Development and the very critical local government group applications. We have put people in boxes in a vertical organizational structure. We see the highway as totally changing the way we do business in North Carolina government.

The criminal justice corrections system is to be an integrated system. We are working now on it being totally integrated from the time of arrest to arraignment -- and to court. Then on to prison and to parole.

Currently in our state, if you are a prisoner, you can have five numbers from five different types of networks. And with a state that's focused on issues of crime, it's very important for us to look at it in a very integrated fashion.

On the libraries — that's all libraries — public schools, universities, community colleges, hospitals, or any other library that's there, we are forcing them to work together across all barriers.

On the health and medical, we're working at the local level, the regional level, and at the state level. We have our triage medical centers, our regional hospitals all the way down to the small clinic out in rural Appalachia. They are developing the system of how to work together in those communities.

And the education team is really from the time you're born until you die; it's K through 12, it's community colleges, it's universities.

We've found, in our state, that you can go to a community college and enroll for a full nine hours there, but it is not possible to go over to the university across town and take a course at the same time. This is a stupid rule, but it exists. So we have been really what we call "barrier-busting" with this highway.

Now we have a setup in education saying, "Leverage those dollars from the 10th through the 12th grade, community colleges, and through the first two years of the university." Japanese 1 and 2 is the same whether taught at high school level, community college level, or university level. Use professors to team teach from the high schools to the community colleges to the university and back the other way. Get beyond the idea that a university professor is somehow better intellectually than a community college professor, who also has a Ph.D. When we have a Ph.D. from M.I.T. teaching at a community college — and yes, we do have some of those — and we have a Ph.D. from M.I.T. teaching at a university — there is no difference in their ability to transmit that information. You're going to have to look at all the issues in education, including what we call operational barrier issues.

We would never have gotten people together without this highway. They want to come on it, and we are using it to force people to look at the way they do business.

On government, we are absolutely committed to efficiency; one network or one highway with a series of different lanes and so forth; database sharing, emergency management from our hurricanes on the coast to our weather collection being captured with wireless sensors that are transmitting over to our terrestrial fiber, et cetera.

Records access, video conferences, electronic town hall meetings made accessible in education, shared resources, equity, shared master teachers, and video field trips are what we're looking at below the university level. And teacher training; we are absolutely committed in this area to making certain that teachers learn how to access information. That's what the library access stands for -- education reform, new teaching methods, positive results, with outcomes tied to our network itself.

In education, we talk about the use of libraries — for example, to allow public schools instant access to networking by libraries and universities. We want our students to be able to access the library at Chapel Hill or at Duke or at Wake Forest, and that causes us another problem: We've been operating with our Linknet program tying our libraries together for about ten years on the data highway, and all of a sudden when we go to the attorney general's office they say, "Hold a minute. That's illegal." We say, "Well, we've been doing it." And in fact, we're going to continue to do it with the new highway until we're sued. So we sort of ignored them.

In terms of public policy issues and user fees, we're going after the least-cost model. Here you see library use could be a problem on this: minimum service levels, short-term results, not long-term interests, the issues that we're working through; self-centered not collaborative -- these are problems that people bring to the highway, and they're not to reinforce institutional boundaries.

We can look at the investor approach; the state appropriation where we are promoting collaboration, where there are steady standards of interoperability, quality, equipment integration, applications development, and the establishment of usage rates. The utilities commission will be reviewing our pricing structure and making certain our telephone companies' current revenues are not subsidizing the development of the highway.

One thing we have done is driven a whole pricing structure. Some telephone companies will tell you they can't do it, but they've done it in North Carolina. We are basically using a new pricing structure with the phone companies: We are going to be charged for time on the bandwidth and the amount of bandwidth we're using. That's a big difference from what government has had to pay for in the past. Normally there are dedicated lines.

We actually had to work our way into the telephone company marketing or pricing structures to talk them into this; and the tariff is being filed with the Public Utilities Commission (PUC). I'm sure it's going to cause a lot of questions in North Carolina, but we're pretty sure we can get this through the PUC in our state.

The rate-setting process includes the capital cost of equipment and the installation fees; the offsetting monies come from grants, appropriations, and amortization. This boils down to what the startup cost is for users. Our pricing structure is set up so that a little school up in Swain County in the mountains is not going to have to pay more than a school in Wayne County to access the highway. We priced it that way in the introduction of the first phase to make absolutely certain we get as much use as possible.

Our pricing is based on an access charge and a usage charge. The access charge and the usage charge are problems. We need to look at the whole U.S. regulatory structure on the access charges.

The tariff filing is going to be very interesting for us over the next month and a half. We are planning to have our fees ready by January, because we plan to start using the first phase of the highway in January. We have gone out with an interexchange request for proposals (RFP). That's causing some problems because a lot of the interexchange carriers aren't where we're at yet, but we are demanding ATM interconnectivity in our interexchange fees.

We have come up with a CPE (customer premise equipment) bid that says, all of these pieces of equipment, these thirty pages, are interoperable on the highway. You must buy one of these. If you want to buy something else, forget it, the state's not going to sign off on that. We are going to demand that you be interoperable with the highway equipment to come on the ramps of the highway. Even though you might not be coming on the highway until next year, what you're buying is going to be interoperable and compatible with the highway.

We are also going through to the actual switch maker, which in this case is Fujitsu. We didn't buy the switches, the telephone companies did. We said to Fujitsu, "you must in fact drive more toward open architecture and interoperability." We think the switch is the most interoperable, and has the most open architecture in the country now. We are also giving the exact same message to all the companies that we deal with in the purchasing arena of North Carolina.

I have not said one word about fiber to the curb or fiber to the home. The reason for that is this, we want a statewide backbone network; that's what we're driving for. We're not as interested in fiber to the curb and fiber to the home right now. We are concerned about getting that backbone highway out there before the internecine warfare of all the people who are in the fiber-to-the-curb and fiber-to-the-home business moves back toward the backbone network. There is no way right now that a cable company could come to North Carolina and get together with the sixty-eight companies in our state and be able to provide a network that is ubiquitous, that is redundant, reliable.

When we are dealing with data in our state, it has to be able to be transmitted. You can't look at your screen and it says, "Oh, Channels 60 to 120 are not working now." You check it an hour later and it's still not working. We have lots of problems with reliability in the cable industry. We're not ready at this point to see that the cable companies can have a statewide network.

We have had probably three hundred and fifty involved on our side working on the highway, there are over five hundred from Fujitsu and probably another three hundred from the telephone companies. This is not an easy thing to bring about. We meet every Monday morning in our steering committee sessions, and then we meet with the local exchange carriers; and as soon as we get the interexchange through, we'll meet with them in the afternoons.

We're going to have to spend a lot of time in the next couple of months working with our Public Utility Commission. And we've already tangled with the press. The press has been to us and tried to tell us that we should hold off for awhile, not put this network out there; that the state should in fact be very aware that the press has problems competing technologically and is at a disadvantage right now.

Our comment has been that freedom of the press is guaranteed by the Constitution, but it does not guarantee freedom for profit. So we are very focused on making certain that the people who want to provide content try to get themselves up to speed as quickly as possible.

Let me just wind up by saying a couple of things. The first is, we have had lots of problems with the issue of terminology, and I'll give you one quick anecdote to remind you of what that is:

Growing up in southeastern North Carolina, I grew up with lots of Baptists, and I would go to Wednesday night prayer meeting after my father's death, and my mother would say to me, "Jane, come back and tell me what they said."

So I came back one night and I said to her, "Mom, they said for you not to worry, you're going to get your quilt." And she said "My quilt?" She said, "I don't think you were listening. You were doodling again." I said, "No, it's your quilt, you're going to get it."

So she called the minister up and said, "Mr. Gantt, what did you preach on tonight?" And he said, "The text of my talk tonight was 'fear not, for thy comforter is coming.'"

I say that because that's exactly what we deal with when we talk between public and private. We have terms that mean different things. They mean exactly the same thing sometimes and sometimes different things. So we're really having to work and walk our way through this with the telephone companies and with our government officials from crime to health to education, libraries, et cetera. But it works, it is doable, and we're doing it in North Carolina.

Finally, I've been working very hard lately with the presidents of our universities to change one requirement for graduation. That requirement is that you have to be able to swim. It's been there for years, a hundred years at the university at Chapel Hill; you have to be able to swim.

So what I've told them is, "That's fine, we need to change that paradigm a little and say that 'you have to be able to surf through cyberspace.'" And what we are working with them to do now, and what we hope they're going to do, is require that when you graduate from the universities of North Carolina, you have to take a test that shows that you can actually access online information, bring down data from numerous sources, and create an actual paper, document, or research project in order to be able to graduate. Then you will get a seal that says you can surf through cyberspace.

QUESTIONS AND ANSWERS

MS. SHAPIRO: Beth Shapiro, Rice University.

I don't know that anybody in this room lived through the implementation of the telephone system in this country, but we've all been tortured by the implementation of the cable systems in this country, and I guess the thing that concerns me, as the private sector and the cable companies get into controlling more of what happens, is how can we be assured that there's going to be high enough quality that service is going to be reliable? Cable service is very unreliable; in the two communities I've lived in, it's been ghastly. The implementation of the fiber optics network has reduced the quality of what we get at home. It's criminal, and they have a monopoly without any real regulation that controls, and the consumers are sort of held at bay. How can we be assured that the implementation of the national information infrastructure is not going to fall prey to the same things the cable companies have fallen prey to?

DR. NELSON: You said the main word, the most important word; and that was "monopoly." We really have had a number of monopolies, particularly in the local telecommunication networks, which although in many cases they have been regulated, have not always worked as well as we would like. This administration is committed to opening up the local telecommunications networks, to encouraging competition, and I think that, more than any regulation or anything else we can do, would help provide for better service.

As I mentioned in my talk, it's very clear that the phone companies are moving to connect very high speed, switched networks to homes and businesses; at the same time the cable companies are moving the same way. The recent merger of Bell Atlantic and TCI is going to accelerate that trend as they take the cable plant that's out there, the cables in the neighborhoods, and put switches on so that they can start delivering interactive services right into the home.

That's going to provide for a lot of competition. You're going to have the phone companies competing with the cable industry and with wireless and other providers to see who can provide the most useful bits to the most customers for the least money. And that's what we're after. I think that's the fundamental change we have to make in the way we regulate this industry and the way the industry is structured. It's not going to happen overnight; there's no miracle cure here. But we are committed to moving forward to providing more competition in the marketplace, and I think that will have major changes in the services that customers seek.

MS. MARTIN: Sue Martin, Georgetown University.

I don't think I heard any of you talk about the reliability or validity of information on the network or the archiving of information. For example, government information, which is certainly something that this group is particularly concerned about.

At the risk of posing a somewhat negative question, do you believe that this is not an appropriate policy role for government agencies to be looking at as they deal with the burgeoning network?

DR. NELSON: No, I think that will continue to be an important role. A lot of this technology will make it easier for agencies to do proper archiving of their records. One of our goals is greater access to information, and in many cases that will mean making information available to depository libraries electronically, giving libraries throughout the country access to government databases. There's a lot going on in that area and we are committed to making it happen.

But we're going to have to approach it somewhat differently. We're not going to have paper in all cases, we're going to replace paper with databases; we are trying to bring the U.S. Government Printing Office (GPO) into the twenty-first century, which is going to be a challenge. One of the key findings of the Reinventing Government Task Force is that the GPO is an agency based on an old paradigm: Expensive printing presses, paper-based records — things are different now.

The Archives are going through a similar transition as they move into this new world where everything is available electronically. And I think the people at the Archives are realizing that, and I think they're moving forward.

MS. MALLETT: There's the other half of that question, which is, we're losing information. I know as a government person, a fair amount of confidential data flows around on our e-mail system, and a lot of it's getting deleted. And no one is paying any attention at all in Canada to that fact.

And for someone who was trained as a historian, that bothers me a lot; but I'm still doing it. I think that's a policy issue the governments really have to come to grips with.

DR. NELSON: In the United States, in contrast, we may even have gone too far in that direction to the point where we're saving everything electronically. There needs to be a balance, because people should be using e-mail as they use the telephone. And they shouldn't have to think about whether what they're writing will be in *The Wall Street Journal*.

So there has to be a way to differentiate the informal communications that often are done on the telephone from actual documentation and actual policy decisions and policy memos. But that's a difficult call, and it's another example of where we have to rethink our regulations and our procedures.

MS. CHAMBERS: Joan Chambers, Colorado State University. My question is also for Michael Nelson.

When you listed the agencies that were represented on your Information Infrastructure Task Force, there were none with explicit responsibility for education. And, I wonder, who is going to be representing the interests, concerns, and needs of K through 12 and higher education and the researchers and scholars in research libraries?

DR. NELSON: I'm going to stop using that slide. The heading is Key Agencies. These are the agencies that are involved in every aspect of the task force. There are lots of different groups; the applications group, the telecommunications group, the information policy group — the agencies that are up there are the ones that are really in every group.

The Department of Education is very, very involved. Madeleine Kunin is personally involved, and Linda Roberts, who just came over from the Congressional Office of Technology Assessment, is taking a key role. But there are some issues that the Education Department is not very involved in; for instance, determining allocation of the spectrum.

So they have a key role to play in the applications area and in the information policy area, but they're not in every issue. Likewise, the National Science Foundation is very involved in most of the issues that the telecommunications task force is working on, but not involved in every issue.

I think the education community is very involved; it's just that that list is meant to be the five or six agencies that are most involved. The actual list of agencies involved is about twenty-five agencies long, and it includes the Department of Education, Department of Labor, National Science Foundation, and other agencies that have a key role in education.

So I would rest assured. I think the education community is very well represented, and the Librarian of Congress is on the task force, and they have been very involved in several of the different working groups that are out there.

MS. PATTERSON: I might add something to that, though. I think I'm hearing throughout the education community and the library community there was real concern about a need to strengthen the Department of Education and its capabilities in terms of being involved in a meaningful way.

DR. NELSON: And I think that's why Madeleine Kunin, who is Deputy Secretary of Education, is taking this on as a particular priority; and Linda Roberts, I think, will really rejuvenate the Department. There have been complaints for years that the Education Department has not been moving forward fast enough in this area, and we are dedicated to making that change.

MR. BENNETT: Scott Bennett from Johns Hopkins University. I have a question for Mike about the on-ramp programs.

I'll start by saying that I'm sure everyone in this room applauds the leadership of this administration if for no other reason than because our libraries are vital parts of the management of the information on this highway. Every library represented in this room is at least a key to the delivery of information within its state. Many of the libraries in this room are national resources.

We see the Title II programs in the Higher Education Act as having been specifically rewritten to help us function as effective providers of information in this new environment. My question is, given that we see it that way, we're a bit puzzled by why the administration, which sees so much so accurately, sees the Title II programs so differently.

DR. NELSON: Well, I think there is some reformulation going on at the Department of Education trying to determine how best to serve this community; how to help the largest spectrum; the most people most effectively.

The federal government provides a very small fraction of the overall funding for education and libraries. And so the question is: how can we play the most catalytic role possible with the few dollars that we spend? And I think there have been concerns in the past that some of those grant programs have done a great deal for a few institutions and not done enough for everybody else.

There is some careful thought going into this, and I think the Education Department will be coming forward with some proposals. The other big problem is just a lack of money, so we have to make sure that the money is being spent effectively and in ways that benefit the entire community. It's particularly hard in the education area where again, for K through 12 education, we provide 7 percent of the funding. So we must find ways so the dollars get spent very effectively and where there's a lot of leverage; and that's what we're trying to do.

MS. VON WAHLDE: Barbara von Wahlde from SUNY–Buffalo. I have a question for Jane, and I'd like to make a couple of observations before I ask a sort of multipart question.

We've heard Mike on the infrastructure and the national highway; and we heard Jane on what appears to be a kind of a local highway that fits into a national highway system. In New York State we have several highways that serve different purposes within the state, and there is some discussion that these need to be integrated and merged. But what I found very interesting is the kind of statewide commitment and the recognition that this will not only help the economy, and I envision that some of our jobs are going to move to your state.

But I'm curious about the level of comprehension — and you may not have an answer to this — nationally for our governors on this kind of a direction. It's very mixed in New York State. The governor talks about the value of this, and he sees information as being important; but there doesn't appear to be much of a strong movement in this direction. And the libraries are such key players. The libraries are better organized, I think, in terms of using networks to make connections already.

So how do we have some impact within our own state to create something similar to the North Carolina highway?

MS. PATTERSON: I can answer that fairly quickly, actually. The critical thing is for you to develop the leadership from the grass roots up, and to develop a committee that takes in industry, education, and government; and to beat that drum all across the state, and to hold meetings down at the local levels and every single county about how they can use this network and make the sound so loud that the governor hears it.

That's the way we've done it in North Carolina. At the national level, within the National Governor's Association, I think you're going to see more focus this next year on telecommunications as a real enabler. It really should be transparent; it should be enabling us to have information transmitted among libraries and not be the focus; it should be the enabling technology.

The criminal justice information is critical in states and it can only ride on this kind of highway. You have to have imaging. In fact, we're now changing from fingerprints to looking at the retina of the eye, which is a lot better. You cannot change the retina of your eye unless you take your eye out.

But anyway, there are a lot of interesting ways to get the governor to be involved. The most critical way is from the voters. And I think you'll see that the voters across the country really want access to this kind of highway. The vice president has done a lot to elevate this in the eyes of all of the governors as well.

So I think the issue is organize. Organize. Organize. Which librarians are always really good at doing.

DR. NELSON: Excuse me. I'd like to add quickly to that last question.

New York has been doing some pretty exciting things in the area of telecommunications policy, and I think they've taken a different approach. Each state is taking a different approach.

MS. VON WAHLDE: It's moving forward; I don't mean to imply that nothing is happening.

DR. NELSON: But I think it's important to realize that there are two approaches. One is to invest directly in the network; the other one is to open up the network, which New York is doing very nicely. And they're trying to lower the prices, so individual institutions can go out and buy high-end services. I think that's very useful.

[Recess.]

PROGRAM SESSION II

THE PLAYERS

INTRODUCTION

Hiram Davis
Michigan State University

DR. DAVIS: I want to welcome you to the Program Session II, entitled "The Players." My name is Hiram Davis from Michigan State University.

In Session I we heard of the information infrastructure as an instrument for economic development and educational and cultural enrichment. Differing approaches in Canada, in the United States, and within North Carolina highlight the importance of creating this infrastructure and how vast an undertaking this will be.

Another crucial element of this information infrastructure map are the views of the builders, the providers, and the users. Depending on which community's vision or pieces of their vision is implemented, that will determine what this information infrastructure will look like. This session will describe differing approaches to this infrastructure and what choices lie ahead.

We will hear from representatives of four key constituencies and major stakeholders. They are the telecommunications sector, the computer industry, and the education community. And last and certainly not least, the public interest community.

Our first presenter will be Sonia Jarvis, who will present the perspective of the public interest community.

Ms. Jarvis is the executive director of the National Coalition of Black Voter Participation and a graduate of Yale University Law School. Previously, she worked for the National Security Archives as an associate general counsel and clerked for Judge Frank Johnson of the U.S. Court of Appeals.

Ms. Jarvis currently works with the national organizations on issues such as civic participation in terms of women's civil and voting rights, and international electoral reform.

In speaking with her before we started, I understand she is now teaching a course at Harvard University, which maybe she'll have an opportunity to make some reference to that following her presentation.

Representing the computer industry is Ken Kay, a legislative and coalition expert with the law firm of Preston, Gates, Ellis. Mr. Kay currently serves as executive director of the Computer Systems Policy Project, an affiliation of companies that focuses on technology and trade policies; and on the Council of Research and Technology, a coalition of companies and research institutions that support research and development initiatives.

Tom Spacek joins us to present the views of the telecommunications industry. Mr. Spacek has worked for the Bellcore since 1984, holding a variety of positions including executive director for business and market analysis of information networking services, and then moving to his current position as the executive director for the National Information Infrastructure Initiatives.

And last but certainly not least, a person who doesn't really need an introduction to this group is Paul Peters. Paul, as you know, is the director of the Coalition for Networked Information, whose mission is to promote access to information resources in the networked environments in order to advance scholarship and intellectual productivity.

Prior to joining the Coalition, Paul was systems coordinator at New York Public Library, and was assistant university librarian for systems at Columbia University.

THE SOCIAL AND LEGAL COSTS
OF THE INFORMATION SUPERHIGHWAY

Sonia Jarvis, Esq.
National Coalition on Black Voter Participation

MS. JARVIS: I certainly appreciate the opportunity to address this annual meeting, because I respect the work that you do, especially now that I'm teaching and I have to rely on our librarians a lot more than I ever did before. But also because I think the issues we're going to address over the next two days here are critical to the future of higher education and to the health of this nation's democracy in general.

The title of my talk today is "The Social and Legal Costs of the Information Superhighway." The subtitle is "Don't Be Blinded by the Hype." What I want to try and talk about is: What is it about this convergence of new and old technologies that has everybody so excited? And by convergence, I mean the combination of regulated monopolies like the telephone industry with unregulated private industry such as computers. And we've all heard about the advent of 500 TV channels and the ability to bank from home and wide access to information all over the world, which in turn should lead to better educational opportunities for our children, the ability to participate more fully in the political process, and on and on and on.

As a civil rights lawyer who has worked closely with disadvantaged communities to lower barriers to participation and voting, I'm concerned about the way our excitement over the creation of this new information superhighway is clouding our basic common sense and our critical faculties as members of a democratic society. And before I provide a few illustrations of my point, I'd like to state my view, that technology cannot be separated from the uses for which it was designed.

Whether it's actually put to positive or negative uses depends on the people making the application, a point that sometimes gets lost in the rush to speed down the information highway.

Let's look at a few of these examples more closely. The 500 channels: Sounds great, I'm very excited about it, and I think it will be wonderful if we're talking about a rich variety of cultural programs and movies on demand and wider cultural offerings and a way to bring people together; but it doesn't sound like a major revolution to me if those 500 channels mean 200 channels of *The Brady Bunch* and another 200 channels of *Father Knows Best*.

I still can't figure out how the public interest community slept through QVC's successful effort to convince the Federal Communications Commission (FCC) that it should be a "must carry" channel because it served the public interest by allowing homebound elders to buy fake jewelry.

Not to be outdone, last Friday's *Wall Street Journal* reported that the PBS station with the highest ratings, and that's WTTW in Chicago, will now start offering a home shopping service, and these will be goods that you can find at a museum gift shop or at a fancy import store. Critics point out that WTTW will be using public airways for this purpose, and these airways were set aside not for commercial benefit but for educational purposes. I submit to you that I think this will just be the first of many disturbing developments, as broadcasters search for revenues in an increasingly complex environment.

Let's look at home banking. We've been hearing about this great service for years, but it now looks like it's finally going to become a reality. It languished for a long time because people didn't trust machines to give them their money. And now we see that the relatively quick adoption of automated teller machine (ATM) technology has given home banking a chance for success. But I guess I wonder why we should treat banks any differently just because they're offering new services. ATM machines, after all, were made so that banks would not have to hire as many tellers; and these are the same institutions, twenty-eight years after the Civil Rights Act, that still haven't figured out that it's illegal to discriminate in mortgage lending on the basis of race or sex or national origin.

My point is simply that we should not give up hard-won rights as citizens or as consumers just because we're overwhelmed by the gee-whiz factor.

Another example is the wider access to information and better schools. I happen to be a great fan of the Internet and probably spend more time than I should trying to figure out what's on it. And I guess I'm particularly enjoying it in an academic environment where it's not costing me thousands of dollars to learn how to use it. But I think that a lot of the assumptions about wider use of the Internet are based on the thought that our public school systems or public libraries can help bring this advance to the greater public.

The fact is that a lot of our public school systems are falling apart because of taxpayer revolts, and our public libraries, which have historically been a beacon of hope for immigrants and for the poorer segments of our communities, are facing shrinking budgets, layoffs, and closures at precisely the same time they're needed the most.

Moreover, one of the incentives for creativity has been the copyright and patent systems, through which writers and inventors receive compensation for use of their ideas and creations. Who is going to ensure that these creative people continue to receive just compensation when the very nature of a digitally based system renders most of the copyright laws obsolete on their face? If works can be freely morphed or sampled without regard to royalties or a permission process, authors may decide not to allow their original works to become part of a library's collection, especially if it's part of an online system.

And thus, instead of becoming an advance in knowledge, this digital revolution could actually return us to the days when books were owned only by the elite.

Now I turn to one of my favorite subjects, which is voting from home. In fact, it's the reason I got involved in this area. I had gone to a conference that the chief state election officials hold every year, and this July they predicted that in ten years all of us will be voting from home; and everybody applauded and got very excited about it.

I raised my hand and said I had a question, and I was wondering, What if you didn't have a home? How are you going to be able to vote? And if you did have a home, what if you didn't have a phone? What if you didn't have a computer or if you couldn't afford the cable access charges, how were you going to be able to participate as a full member in society along with everybody else?

Their response was, "Sonia, you're being hysterical again, just calm down. This is all going to work out. We'll have special stations for people who can't vote from home." I said, "Oh, so you can segregate their votes and know who the poor people are so that you can then, in turn, ignore their votes."

"No, no, no, that's not the reason."

"Well, then, tell me, how is it supposed to work?"

We went on for a while, this little exchange, and it wasn't until I made the point that basing these assumptions about democracy on a person being able to buy a $2,000 machine and having regular cable access sounded to me like a poll tax, and that that was still illegal under the U.S. Constitution, and furthermore, the complexity that would be involved sounded like a literacy test, which is also still illegal under the Voting Rights Act.

We've seen that voting is already easier than it's ever been before, and that should even become more so after the Motor Voter bill is implemented next year. But we know that an easier process has not automatically led to higher rates of participation, because one of the reasons people don't vote has to do with attitudes, not necessarily access. Common reasons for non-voting include feeling that their votes don't count, that the results are fixed, the candidates don't represent them, et cetera. And I just wonder how these feelings of alienation will become more intense when election results can be changed with a few keystrokes.

I'm always promoting better interactivity between people and their elected officials, but not if it means political decisions being made on the basis of glorified instant polls instead of a serious debate on issues affecting the common good.

And I still have not reconciled how those who were planning systems in which people would never have to leave their homes -- you're going to be able to telecommute, you're going to have home shopping, you're going to have home banking, you're going to be able to vote from home, you're going to have virtual reality for all your entertainment needs -- how are these same people going to somehow magically become better citizens? They're never going to leave their homes!

And these are some of the assumptions that I just want us to think about as we're getting excited about the information highway.

These examples bring me to my second point, which is that we should not be blinded by the promises made by those who stand to profit most from these new convergences. The recent explosion of mergers and consolidations means that a handful of companies will control both the distribution and programming of all data that enters American homes. That makes me very nervous.

Who will determine issues of affordable access, acceptable usage, matters of privacy and confidentiality? I just don't hear these issues being discussed enough as we talk about the highway. The debate over these values, which are central to what it means to be an American, should not be left solely to commercial interests or to our deficit-ridden government. This administration was not even going to appoint public-interest representatives to its advisory committee until it received some pressure from the Telecommunications Policy Roundtable.

According to an article in the latest issue of *The Economist*, 40 percent of the world's population has no access to electricity at all. And Chris Irwin of the BBC has observed that 65 percent of the world's population has never placed a phone call. With such low levels of market penetration, I think we should view with intense skepticism claims that this new convergence will automatically lead to better global communication.

In this country, we're seeing telephone usage actually decline for the first time as some families simply cannot afford even the basic service.

I think we should also analyze these rapidly forming mergers on both economic and political grounds. There are observable economic patterns at work. We move from an entrepreneurial enterprise to a consolidation to a monopoly position, which spins off into new entrepreneurial enterprises. Our telephone system, railroads, steel, public utilities all follow this pattern.

The government tends to intervene near the end of the cycle, through regulations and legislation, in order to protect the public interest. However, this time around we're hearing the administration suggest that it may be necessary to relax antitrust regulations and other utility laws in order to encourage private industry to build the electronic superhighway.

At a conference that the Office of Management and Budget (OMB) had last week, they actually discussed the concept of having telecommunications enterprise zones, where all normal regulatory controls would be suspended. I submit to you that the merger mania that we've been seeing over the past three months demonstrates that private industry does not need any further encouragement to concentrate power in just a few hands.

I think the beauty of the Internet has been the ability of individuals to learn and experiment on a global scale. The future, if the commercial interests have their way, will be more Mead Datas instead of programs like the University of Minnesota's Gopher.

Also, I think the analogy to public highways is very instructive. The interstate highway system built its ramps through stable but politically unsophisticated neighborhoods. After it was built, we were very happy with the highway, but we decried the loss of communities and the increase in urban blight, and we wonder why many of these areas have never recovered. That's because they remained cut off and abandoned because the residents of these urban renewal neighborhoods did not have the political resources to rebuild their communities.

I think what we're seeing now is that this new electronic highway will bypass these same neighborhoods altogether, since many of these are the homes without phones or cable TV or computers.

I mention this factor in all seriousness since the polarization between communities we're currently facing in many American cities could be exacerbated by an information hierarchy in which the disenfranchised feel even more isolated and bypassed by the process. In other words, there may be reasons for telecommuting other than just personal preference.

I think if we were discussing a network built solely with private money I might not be happy with what I'm seeing, but I'd have to live with it. But we know that the backbone of this new process would be the Internet, and this was paid for by taxpayer dollars or through congressional appropriations. And instead of a real dialogue on the appropriate uses and safeguards of the new technology, I see the regulated industries using the so-called new convergence as an opportunity to void current laws and regulations.

It seems to me that the same old players are simply trying to receive a higher return on their investment by charging more for similar services.

For example, let's look at the cable bill last year. It was supposed to control prices and lead to lower prices for cable service. But instead of lowering prices, cable operators used the new law as an opportunity to change their pricing structure. Homes that had used premium channels and multiple outlets were the only ones to experience a price break, while those using basic services, the majority of homes, saw their rates go up. Yet they did not see customer service go up at the same time.

This is the kind of pattern I think we're going to see in all too many instances, and that brings me to my final point, which is that we are on the brink of a cultural revolution between those who have access to information and those who do not. I think it would be reasonable to assume that at least 10 percent of our population will have full global access, another 20 percent will have some kind of limited access, and the remaining 60 to 70 percent will have no meaningful access to these networks.

I base this prediction on a couple of factors, such as number of homes that already have computers and the literacy rate, with our Department of Education telling us that half of our adult population has trouble with complex information. If people have trouble with complex information, how can we expect them to be able to program their home computers? You know, many adults have problems even programming their own VCRs, and how are they going to be able to deal with video on demand and international library catalogs without running up huge bills?

Just at the point that Americans are buying more computers, corporations are now charging for technical assistance. This is the kind of thing that I think we just need to focus on. Instead of looking at models that encourage use, we're seeing the opposite effect.

One of the reasons people, older people especially, don't vote is that they are afraid of making a mistake with the punch cards. How much more complicated will it be if we expect them to program their home computer and vote from home as well?

Finally, those with control of the information highway will have a unique form of power: control of all data that enters and exits every American home. If we've learned nothing else over the past 500 years, I think it's the danger inherent in the exercise of power without constraints. Technology, after all, does not change basic human nature.

In sum, I'm hopeful that when we welcome in the twenty-first century, we will not have cause to regret our failure to address the social and legal costs of this highway.

THE COMPUTER INDUSTRY'S ASSESSMENT OF THE NII

Kenneth Kay, Esq.
Executive Director, Computer Systems Policy Project

MR. KAY: Good morning. I'm Ken Kay, an attorney in private practice in Washington and executive director of the Computer Systems Policy Project.

I want to say how much I appreciate the introduction. I got introduced yesterday as a lawyer-lobbyist, and I thought, "What a low blow."

I got a letter two weeks ago that made me feel a little better. It was from a woman attending law school in New York who was looking for a summer clerkship, and she said she was writing me because of my growing reputation as a cyber-advocate. And I thought, "I really like that term. She's well on her way to her clerkship."

I really want to get two things done this morning from our perspective: give you a sense of some of the issues that the Computer Systems Policy Project, the computer industry, has focused on in the whole debate over the High-Performance Computing and Communications Initiative (HPCCI) and the National Information Infrastructure, and then briefly talk to you about our views on how this administration is doing.

I would very much agree that the NII debate, as it is developing, is being taken by some who have been working in the telecom policy area for the past fifteen to twenty years as an opportunity to simply put a different package on an age-old telecom policy debate. And from our perspective in the computer industry, it would be really regrettable if all we were able to accomplish in thinking about a national information infrastructure was to find a new forum in which to continue what we described as a food fight between telephone companies and cable companies.

Our sense is that this NII is really much bigger than just a telecom infrastructure. It is really four infrastructures. There's a communications infrastructure, a computing infrastructure, an information infrastructure, and a human resources infrastructure, all four of which make up the NII. And it's our serious concern that both policymakers in Washington and members of this new administration, who have been used to a simple communications policy and FCC orientation to the whole debate, are not broadening their view to encompass the reality of what the NII is going to take.

Having said that as a point of departure, the thirteen chief executive officers (CEOs) within the Computer Systems Policy Project have really had four basic points to make about the debate as it has evolved over the past three years. And I'd like to talk about each of those, particularly from the perspective of you in the library community. At least three of those points have a role to play and a different perspective to offer.

The first is, when we looked at the HPCCI, which is the government's research program in this whole area in 1990, and looked at the NREN that's related to it, the CEOs noted two things:

The first was, they liked the program, it ought to be funded. The second was, its management was terrible. That's a point people don't want to talk about. I think you in the library community in particular can appreciate how management-intensive networking is, and how management-intensive the line of work that you are in is.

Our sense is that the government program at this point is a loose configuration of eight different agencies trying to look at an R&D agenda for high-performance computing and communications. The program has no plan, has no objectives, has no milestones; and it is very, very difficult for either the library community or the corporate community to figure out where that program is going, where it's trying to get to, and whether that money is being adequately spent. There is, in short, no accountability within that program.

It seems to me that those of us in the corporate community and those of you in the library community ought to be addressing that as a public policy problem with the program, because it's getting worse, not better.

The second basic point we made was that the program had what was called the high-end applications emphasis; the grand challenges of human genome research and other similar types of problems. And the CEOs basically said, and I think unfortunately it has turned into an accurate prophecy, that if the program stayed as narrowly focused on high-end applications and on linkages of M.I.T. to Stanford to work on human genome problems, that the long-term prospect of political support was relatively minimal.

I think we are finding now that the support in Congress for the program is already beginning to erode, in large part because the program itself has refused to make linkages to generally socially beneficial applications. This applications message is very, very important, because I think it's clear that a number of us agree that pay-for-view is going to take care of itself as an application. We don't need to worry about it, the government doesn't need to worry about it; but the applications of educational uses, the applications of health care delivery, the applications of government information are not likely to receive the kind of attention early enough to jump-start those applications.

And if we really want demand for the kind of ubiquitous infrastructure that I think a lot of us are looking for, those applications are going to have to work, work early, and create demand from those ends of the applications spectrum. So an applications orientation is very important.

What can you all do? All of us who are interested in this need to tell a better applications story. We tend to tell a technology story. And particularly in the library community, a lot of what you do is linked to the delivery of health care services. It's linked to the delivery of educational services. I don't mean to be too critical, but you're not telling that story to members of Congress and you're not telling that story to the administration. It's the applications message that is ultimately going to carry the day, and if it isn't delivered, these programs will not be supported. That's our strongly held view.

Since the middle of last year, it's become clear that we didn't need to just talk about an HPCCI and an NREN program; that we actually could now talk about a national information infrastructure. And so we are now engaging in a dialogue on two basic fronts: The first, which is probably of least interest to you of all the issues I'm going to raise, is an R&D agenda. Are companies investing substantially in research and development? We are very concerned that there's almost no dialogue going on at this point between the broad government R&D program and the corporate community, and that the money that gets invested in NII research over the next five to ten years needs to be coordinated with likely private sector investments in research and development. So that's something that we think the government has got to substantially improve.

But the second point is going to dominate our conversation in the computer industry for the next couple of years in the same way that we tried to tell the government that the key issue for the HPCCI program and its emergence was applications. What we see as the key issue for the growing NII is not necessarily telecom policy; not necessarily antitrust policy, which is what everybody has been focusing on the past several months and weeks because of the short-term events; but rather the issues of the architecture of this NII and the openness and interoperability of the networks and appliances.

And if one goes down the road of first looking at regulatory issues and antitrust issues, those are very blunt instruments that don't usually work in ways that they're intended to work.

On the other hand, I believe that you will find allies in the corporate community, particularly in the computer industry but also in other industries, who are very interested and have a major stake in the fact that this does not become a series of broadcast hubs in which a couple of providers get to have a wheel and spokes that send out messages, but that the NII becomes a true, interactive, ubiquitous network that is relatively flat in architecture. Therefore the issue is whether we are going to balkanize all these networks that exist and the ones that exist today; the Internet, the state backbones that are being put together in many of your states; the networks that exist as private networks in many of our companies -- and are they going to work together?

We're not focused on that problem, and that issue of interoperability is the key issue in determining whether an NII comes into fruition, because if it is to be the network of networks, and there is no interoperability, you don't have one. And second, for a lot of our companies the issue of openness and interoperability also will depend not just on the issue of whether the networks can relate to each other, but on whether the appliances of the next generation are in a position to be interoperable with the network.

Then finally, one of the issues that really gets lost is this question of who are the providers on the network? And the fact is that individuals, both as businesses and individuals, ought to be viewed as providers, and openness and interoperability needs to be key elements of any planning or any thoughtful move forward toward an NII so that anybody who wants to be a provider on the network can be. So that, in our view, is going to be a central issue.

Let me finally address the issue of how the administration is doing, and it is a difficult issue. I think, in general, they get very, very high points for having created the NII as their number-one technology priority. Although technology policy in general is getting good attention by the administration, I am absolutely convinced that the national information infrastructure is their key technology priority.

I also think that if you look at their stated action agenda, there are two or three very helpful indications that emerge. The first is that this topic has been given a lot of thought. You look at it and realize that a lot of people have been working very hard for half a year, trying to come up with a thoughtful description of what the government's role might be. And also that they actually show some boldness and a willingness to take on a couple of the tougher issues.

They identify universal access as an issue that the government, private industry, and the public interest need to collectively address. That is a tough nut to crack. I don't think anybody should be under any illusions about how difficult that will be to address, but they have indicated that that's one of the tough issues they want to take on.

Second, they have identified, although I'm not clear what the priority is, the issue of interoperability. We need to work on that a little further, but they've identified interoperability as another tough nut that needs to be cracked. Finally, it seems to me that they do, at least as a stated position, acknowledge the four components of this infrastructure; that it is not just a communications infrastructure but also has computing and information components that need to be addressed. I think all of us, by the way, have been derelict in not focusing enough attention on the fourth component, the human resources component.

We have not talked about how as a society we are going to make sure we have the people to operate this NII, and we certainly haven't discussed how as a society we're going to have the minimal technology for all of us to collectively be users of the NII, and that's an area that the administration doesn't address at all in its action agenda.

Having said that, though, I think that the action agenda is a good, constructive step. It's been roundly criticized by some in the private sector because it didn't do enough specifically. And my personal reaction to that has been, "Thank God." The biggest objection that I have to the administration's action to date is that it hasn't been collaborative enough in putting together a real consensus among the corporate community, the public interest community, and the various users. They claim they've done a lot of individual consulting, but it seems to me they haven't even begun the process of getting people in a room and putting a consensus together in very tough areas.

So my response is, until that process begins, let's not make a lot of decisions. And it bothers me a lot that they've attempted, and some have attempted to get them, to make a series of initial decisions on telecom policy when they haven't even gotten an advisory committee to meet yet. The supposed NII advisory committee isn't going to be appointed until the end of the year, and so we're going to have a process in which a lot of the decisions get made and the government's own advisory group is not yet assembled.

So it seems to me that the government is poised to make this issue a centerpiece of their technology agenda, but they haven't moved fast enough. Or thought enough about what role they're going to play with the rest of us in putting a consensus together; and I think that that's an area where they simply will have to improve their performance.

Let me conclude by saying that I think that those of you in the library community who have a major interest in the national information infrastructure have to step up to the plate. This is an area where we have, particularly on problems like universal access, very thorny issues; they will not be decided overnight, and it is our perspective that both the private sector and the public interest sector to this point have not been fully engaged by the government even in the limited discussions that ought to take place on the limited role of government.

It's our view in industry that the private sector will ultimately build this NII, but it's very clear to all of us that if you look at issues like security and privacy, if you look at issues like research and development, if you look at issues like interoperability, where there also may be some limited role for the government to play, that from time to time the government is going to have to come in not as the builder and not necessarily as the ringleader, but at least as a guest conductor to help us iron out some of the thornier problems that we collectively need to agree on.

We look forward to that process going forward quickly, and we look forward to working with you in that process.

BUILDING CONSENSUS FOR A U.S. NATIONAL INFORMATION INFRASTRUCTURE: A TELECOMMUNICATIONS INDUSTRY PERSPECTIVE

Thomas R. Spacek
Bellcore

MR. SPACEK: There is tremendous support and activity in the U.S. for developing a National Information Infrastructure (NII). The support comes from a broad range of stakeholders including the Clinton Administration, the U.S. Congress, the private sector (the telecommunications industry, the computer hardware and software industries, information service providers, etc.), all levels of the education community, libraries, and others. Several visions of an NII have been articulated by industry associations, public interest groups, government agencies, and others. The following vision was developed in May 1993 by the private sector's Council on Competitiveness, which represents a number of users and providers interested in developing a consensus in key areas to help accelerate the deployment of an advanced information infrastructure:

> "The infrastructure of the 21st century will enable all Americans to access information and communicate with each other easily, reliably, securely, and cost-effectively in any medium — voice, data, image or video — anytime, anywhere. This capability will enhance the productivity of work and lead to dramatic improvements in social services, education, and entertainment."

A similar vision was articulated by the Computer Systems Policy Project (CSPP) in January 1993. The CSPP consists of the CEOs of 13 major U.S. computer manufacturers. Although the many visions may differ in emphasis, they appear to be quite similar in spirit and intent, reflecting a growing consensus at least at this 100,000-foot level.

Moving from 100,000 feet to 75,000 feet, we list specific characteristics of a desirable NII.

Meet urgent societal needs: An NII must meet urgent societal needs and maximize benefits to the public. Areas needing particular emphasis are K–12 education, lifelong learning, libraries, healthcare, manufacturing productivity, the environment, and job creation.

Market-driven applications: Additional applications should be market driven to assure that investments made will provide applications and services that meet real user needs and provide a fair return on investment.

Maximum interoperability and interconnectivity: Different networks with different characteristics must work together smoothly and seamlessly.

Universal access: Universal access means universal availability — so anyone who wants to connect to a network that is part of the NII can do so at an affordable price.

Global interconnectivity: The infrastructure should provide a gateway for international connectivity as the Internet and the phone system do today.

User-friendly: Universal access, including access by those who are not computer literate, will require the development of standardized, user-friendly interfaces.

Requires a framework for continued development, growth, and improvement in an ongoing economically sustainable way: It must be planned, designed, and developed to generate sufficient revenue for investment in research and development and investment in new technologies so that it can grow, improve, and prosper over time.

Figure 1 lists some potential benefits of an NII. These range from applications that meet urgent societal needs (e.g., in the areas of healthcare and education), to entertainment services, to business applications (e.g., two competing firms sharing expensive phototypesetting equipment). Many beneficial applications are already emerging. For example, the National Library of Medicine has an online Internet service and the National Institutes of Health have an Internet service for cancer and AIDS information.

An important set of issues surrounds the question of how the NII will evolve and the transition steps to get to an NII that implements the vision and characteristics described earlier. Will the NII evolve from the Internet? from telecom networks? from cable systems? or from some combination?

Potential Benefits -- Some Examples

- Health care
  - clinical information systems
  - health information to the public
  - health delivery systems
- Education and lifelong learning
  - electronic libraries and access to government information
  - virtual classrooms, laboratories, and field trips
  - collaborative learning
- Intelligent manufacturing
  - concurrent and distributed design, engineering and manufacturing
  - virtual designing and manufacturing
- Entertainment
- Telecommuting
- Business applications
  - electronic commerce (EDI,...)
  - shared resources

FIGURE 1

There are several ongoing efforts aimed at realizing the common vision of an NII. Some of these efforts are represented by the rocket ships in Figure 2. The relative size of the rockets means nothing — in addition to and related to telecom networks and the Internet, there are significant and important efforts underway by the computer industry, information providers, telecommunications equipment manufacturers, cable companies, wireless providers, satellite systems, and others. These industries and their related efforts are also not independent from each other.

Listed within the telecom rockets and Internet rockets are some key characteristics of each. Telecom networks have been traditionally voice communication networks and are moving toward data and video. The Internet has historically been a data communications network of networks, and it is developing the capability to handle voice and video traffic. I believe it is not in the best interest of the public or any of these industries for these many rockets to rise independently. It is critical for these efforts to come together by both taking the best of what each effort has to offer and providing competitive choices to customers.

There are several activities underway to bring these efforts together. For example, on the policy side there is the private sector's Council on Competitiveness and the Harvard Information Infrastructure Forum. On the technology side there is CNRI'S Cross Industry Working Team. In addition, Bellcore and others are working on key standards and technologies, including the next generation of the Internet Protocol, ATM, and SONET. We are involved in many of the activities aimed at bringing these efforts together. Hopefully this will result in these efforts coalescing into a NII characterized, where appropriate, by cooperation, partnership, or competition.

If the vision of an NII is going to be realized and if the NII is to be broadly available to schools, libraries, businesses, homes, etc., a large investment will be required in information appliances (e.g., computers, set-top boxes, HDTVs), information content (e.g., digitizing textbooks), network infrastructure (e.g., greater bandwidth to the home, faster switches), and support (e.g., awareness, training). Estimates for just the network infrastructure range from $100 billion to $400 billion. The wide range likely results from varying assumptions made about fiber deployment. No one industry or one organization, including the federal government, can pay for the needed investment. Multiple organizations will not only need to invest, but also provide the variety of skills needed to achieve an NII.

The planning, development, and implementation of an NII needs to be guided by a policy framework that combines several properties. The framework must:

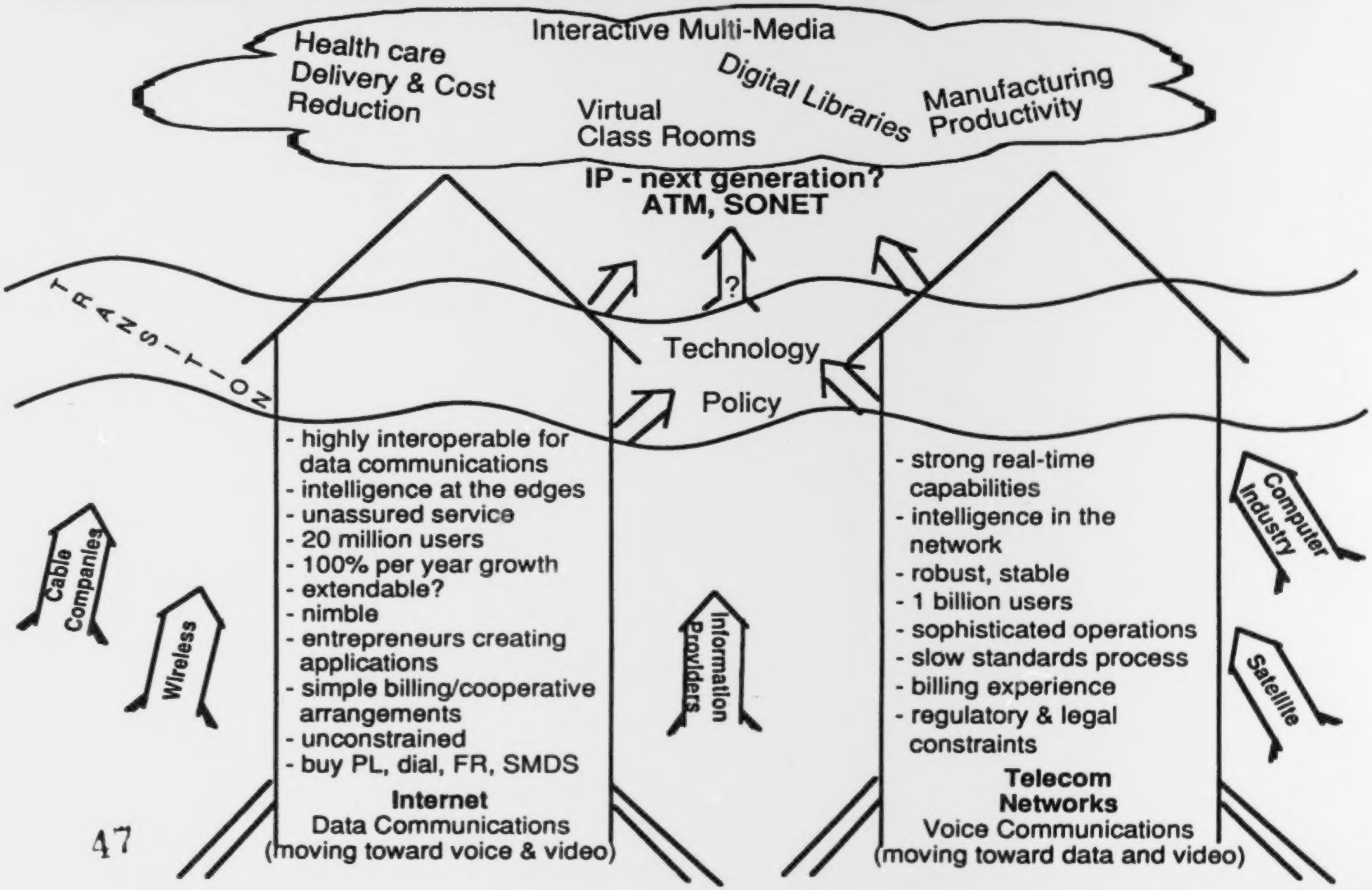
- encourage an NII based on market-driven products and services;
- support societal needs — recognizing that market forces alone may not create the incentive for the private sector to make the investment needed (e.g., in K–12, rural areas); but those needs have to be met;
- incent the private sector to invest, perhaps hundreds of billions of dollars, and provide an opportunity for a reasonable return on investment;
- help insure affordable universal access, maximum interconnectivity, and user-friendliness;
- promote the collaborative environment characteristic of the Internet today;
- result in an economically sustainable system to provide for the ongoing development, improvement, and growth of an NII; and
- address intellectual property, copyright, security, and privacy issues.

How can this be accomplished? Here are some key aspects of a solution framework:

- Government serves as a promoter and catalyst by providing:
  - leadership in standards, telecommunications policy, and collaborations in technology development
  - incentives for the private sector to invest in the NII

FIGURE 2

Evolution to a National Information Infrastructure



Interactive Multi-Media

Health care Delivery & Cost Reduction

Virtual Class Rooms

Digital Libraries

Manufacturing Productivity

IP - next generation?
ATM, SONET

?

TRANSITION

Technology

Policy

- highly interoperable for data communications
- intelligence at the edges
- unassured service
- 20 million users
- 100% per year growth
- extendable?
- nimble
- entrepreneurs creating applications
- simple billing/cooperative arrangements
- unconstrained
- buy PL, dial, FR, SMDS

Internet
Data Communications
(moving toward voice & video)

- strong real-time capabilities
- intelligence in the network
- robust, stable
- 1 billion users
- sophisticated operations
- slow standards process
- billing experience
- regulatory & legal constraints

Telecom Networks
Voice Communications
(moving toward data and video)

Cable Companies

Wireless

Information Providers

Computer Industry

Satellite

- Government shifts its funding support from network providers to key network user communities (e.g., K–12 education). Thus, the government should not build, own, operate, or subsidize networks that offer services in competition with commercial network service providers. As used here, the term "commercial network service providers" includes telecommunications providers, many of the Internet mid-level networks, commercial resellers of network services, and others. This funding shift allows the public, for-profit companies, not-for-profit companies, etc., to use commercial networks, while deserving user communities can receive government support for access to and use of such networks.
- There are some cases (e.g., for national security purposes) when it may be appropriate for the government to develop or subsidize "private networks" or "virtual private networks." Clearly the government, or for that matter anyone, may choose between a private network solution or purchasing network services from commercial providers that use public switched or routed networks. Often that choice is based in large part on whether commercial providers offer services that meet the customer's needs in an economical way. With new data communications services and technology (e.g., SMDS, Frame Relay, SONET, ATM), increased internetworking capabilities, and increased competition in the emerging NII, the results of such customer needs and economic analyses will likely lead to the customer choosing services offered by competing commercial providers.

  However, in cases where the government does develop or subsidize networks, the access to such networks should be limited to use for agency mission requirements. In addition, network services or excess capacity on such government networks (or the government-funded portion of networks; i.e., subsidized logical networks) should not be resold in competition with commercial network service providers. Reselling network services or excess capacity on a government-funded network in competition with commercial network service providers, say, to local businesses, may at first glance have some appeal (e.g., to offset some of the often high ongoing costs of operating, maintaining, and upgrading the networks, servicing users, etc.). However, this appeal will actually significantly hamper the development of an NII and work against the key NII characteristics discussed earlier (e.g., universal access at an affordable price).

  Why? Resale of a subsidized good in competition with commercial providers will cause a significant disincentive for the private sector to invest in the NII. Recall that making the NII vision a reality will require the private sector to invest perhaps hundreds of billions of dollars. In addition, such resale will cause some customers to migrate to the subsidized networks resulting in the fixed costs of commercial networks becoming spread over a smaller base of customers, potentially raising their prices. Hence, what might initially appear to be an appealing way to offset some costs of government networks will actually hamper the development of an NII, and cause the development that does occur to do so in a way that will not be economically sustainable.
- Other appropriate areas for government support include:
  - new network technology development and testbed networks
  - research into user-friendly access to and use of networks as well as training. Significant effort in these areas is essential for use by K–12, parents, teachers, and the mass market in general
  - research into new applications and services.
- Regulatory reform is needed so all players have an equal opportunity to compete. Competition will lead to low prices.
- The decision-making process for government programs should be open. It would be especially helpful to get users and providers involved in order to ensure value to consumers and eventual implementation feasibility.
- There needs to be cooperation among government, educators, industry and users — not only for NII development, but also to find innovative ways to support K–12, libraries, rural areas, etc. For example, CALREN (Pacific Bell) includes a concept where some

users get free use of the network in trade for developing new applications for the K–12 community.

Requirements for realizing the common vision of an NII include a large investment by the private sector, meeting urgent societal needs and maximizing benefits to the public, and providing an opportunity for a fair return on the total investment by selling market-driven applications and services. To achieve these requirements, all stakeholders must share and understand each other's views, and the proper mix of cooperation and competition must be struck. The framework presented does not address all NII issues (e.g., security and privacy), but it does provide a meaningful structure for cooperation among all stakeholders to achieve the above requirements in a way that will provide for the development, growth, and improvement of an economically sustainable NII.

HOW THE INFORMATION NETWORK WILL AFFECT THE RESEARCH AND EDUCATION COMMUNITIES

Paul Evan Peters
Coalition for Networked Information

MR. PETERS: I am Paul Peters and it is my privilege to direct the Coalition for Networked Information.

This a fast crowd so I best get down to business right way, but I cannot resist the impulse to describe my favorite networking "cartoon du jour."

The *USA Today* cartoon that appeared last week: Road-kill on the information highway?

I am very honored to be here today to represent the interests, positions, and approaches of the research and educational community in the development of national, even global, information infrastructures.

I have three basic messages that I want to deliver and explore.

First, the Internet is already just such an information infrastructure. It was built by and it is tailored to the requirements and practices of the research and educational community. It has rapidly become an "essential" feature of the landscape of global research and education. Its continued growth, in all sense of the word "growth," should be a top priority of the research and educational community.

Second, the National Information Infrastructure (NII) initiative of the Clinton Administration is a serious attempt to make the Internet experience the rule rather than the exception of twenty-first century life and enterprise. It promises to stimulate the building of the sorts of network "local road systems" and network "on-and-off ramps" that are already commonplace in the community of research and educational institutions and organizations that make up the Internet. Making sure that research and educational vehicles and cargo can be accommodated by all of these new local road systems and on all of these new on-and-off ramps should be a second, top priority of the research and educational community.

Third, information infrastructures like the Internet and the NII present a number of long-term opportunities and threats to research and educational institutions and organizations. To date, these opportunities and threats have most often been framed by questioning whether certain research and educational facilities, such as libraries and classrooms; research and educational functions, such as cataloging and lecturing; and research and educational artifacts, like books and periodicals, will continue to be facilities, functions, and artifacts in the age of networks. Reframing these opportunities and challenges by questioning the meaning of networks and networked information for the research, teaching and learning, and community service missions of research and educational institutions and organizations should be a third, top priority of the research and educational community.

I will now briefly explore the context for and the implications of the first two of these messages.

My first message is that the highest priority of the research and educational community in this area is the protection and enrichment of the global information infrastructure that the Internet has already become. Here are a few of the most important things that I believe that the research and educational community should keep in mind while strategizing this priority.

Too little has been made of the fact that the Internet was conceived and built by the research and educational community. In addition, too little notice has been taken of the the fact that while the research and educational community was building the Internet, it was also building CSNET, BITNET, OCLC, the Research Libraries Information Network, the Western Library Network, UTLAS, CLASS, and CARL , to tick off just the top of the list of wide-area networking and networked information environments that have been brought into being by the research and educational community. It is arguable that the research and educational community knows more about how to engineer and operate complex wide-area networks and the sorts of sophisticated, distributed applications that are enabled by such networks than does any other sector of society. It is indisputable that the research and educational community has been working on these types of networks and applications longer than has any other sector of society.

Too much has been made of the fact that government funding has contributed to construction, management, and use of the US region of the Internet. In addition, too little notice has been taken of the fact that the government funding that has been contributed to this purpose has always been highly leveraged by contributions from non-governmental sources. It may surprise you to learn that the NSFNET program, which anchors the U.S. region of the Internet, was but a $17 million item in the FY93 federal budget; it is estimated that the research and educational community spent $350 million on the U.S. region of the Internet during the same period. Governments in the US have invested in the Internet in order to increase the productivity and to improve the quality of the research and educational enterprise. It is not appropriate to think of government funding of the Internet as a subsidy to the research and educational community. Keep in mind that government is the primary funder of research and education in the US. It is therefore entirely appropriate, even "imperative," for government to have played a role and for government to continue to play a role in funding research and educational networking. It is also important to keep in mind that, in the main, both the government and the research and educational community have been playing a zero-sum game with themselves as far as the funding of networking and networked information is concerned.

Too little and too much has been made of the fact that the Internet emerged and established itself in the research and educational community in response to the failure of the telecommunications industry to provide cost-effective, end-to-end, wide-area, digital networks and to appreciate the potential of packet-routing rather than circuit-switching network architectures. Regardless of whether this is a fair or accurate construction of the history of the Internet (I happen to believe that it is, but I recognize that others do not), the solicitation for the next generation of the NSFNET that was released on May 6 makes it clear that over the next four years the telecommunications industry will be provided with the opportunity to prove that this market failure has been rectified (or perhaps never even existed). The May 6 solicitation also makes it clear that NSF's investments in networking will move from the "network supply" to the "network demand" side of the total funding equation. The prospect of this new "proof of market" period has generated a good deal of fear, uncertainty, and dread (FUD) in the existing Internet population, and in the research and education community in general. Much of this FUD arises from the fact that the US Internet community will have to learn to do business with multiple rather than a single long-haul provider of Internet transport services and from concerns about the availability and cost of connections to the Internet in population sparse regions of the country. Sound familiar? These are the same sort of challenges and worries that faced the society as a whole when the U.S. telecommunications industry was restructured under the "modified final judgement" handed down by Judge Harold Green in 1982, just over ten years ago ... a restructuring that was accomplished over but two years. I believe that there is a much better than even chance that the new U.S. telecommunications industry will pass this new test during the next four years. I also believe that the research and educational community, together with its funding agents (including the government), has the expertise, the means, and the need to formulate a quick and effective response if and when it becomes evident that the telecommunications industry is not going to passing this test.

My second message is that the research and educational community needs to be prepared to deliver its products and services, to generate its unique research and educational values, using the entire array of network 'local road systems' and network "on-and-off ramps" that will be constructed and operated in response to the leadership afforded by the National Information Infrastructure (NII) initiative of the Clinton Administration.

No matter what much of the political rhetoric would have us to believe, the primary issue being framed and addressed by the NII initiative in the immediate future is not ways and means for designing and constructing "an" information "superhighway." George Gilder, to cite just one of the many experts on this subject who could be cited, has persuasively argued, most recently in his short and wonderful book *Life after Television: The Coming Transformation of Media and American Life,* that the primary issue in the immediate future is ways and means for constructing the local road systems and the on-and-off ramps to the superhighways that already exist. It may surprise you to learn that only 1% of the fiber that has been laid in the U.S. is actually being used; as we say in the trade, 99% of the fiber that exists in the U.S. is laying dumb and dark in its trenches It will shock you to learn that the 1% of the fiber that is being used is being underutilized by a factor of 25,000 times because it being used for circuit-switching rather than packet-routing.

One important reading of the Internet phenomenon is that through building the Internet the research and educational community has made more progress to-date with installing its "last mile" connections than has any other sector of society. This is because the research and educational community has been able to demonstrate to itself and to its funding agents that access to networks and networked information increases the productivity of its members and improves the quality of its efforts.

At least three other communities are now hard at work on generating the vision and resources that they need to build their last-mile connections:

- a community that wants the national information infrastructure to improve the effectiveness and efficiency of enterprises and industries that have a wide geographic, perhaps even global, scope;
- a community that wants the national information infrastructure to make government more accessible and accountable to its citizens; and,
- a community that wants the national information infrastructure to create an entertainment and retail paradise for couch potatoes.

The research and educational community must not become confused or frustrated by the existence of this growing number of last-mile scenarios and communities, or be maneuvered into making false choices among particular scenarios and communities. Each of these new scenarios and communities promises to add new users to and to generate new value in the networked information environment. Those of us in the research and educational community who are primarily interested in what networks and networked information can do to equip people with the knowledge and skills that they will need to prosper in the twenty-first century, can do to advance scholarship and intellectual productivity, and can do to promote the life of the mind in general need to become proficient at taking our vision to and negotiating our requirements with each and every of these new last-mile communities.

However, the research and educational community must also be very clear in its advocacy of, even "insistence on," information infrastructures that employ open, decentralized, digital, broadband, packetized, connectionless technologies and that use a pricing strategy that fixes the cost of transport services while varying the cost of access to particular intellectual properties. The Internet experience has unequivocally established that these sorts of technologies and that this type of pricing strategy will enable a networked information infrastructure to generate a networked information environment. It remains an open question whether other technologies and pricing strategies can do so. The research and educational community is in the best position to represent and advocate the technologies and the pricing strategy that it knows will work and on which it has every reason to believe that its future depends.

My third and final point is that the Internet and the NII present a number of long-term opportunities and threats to research and educational institutions and organizations, and that the best way to frame and address these opportunities and threats is in terms of the research, teaching and learning, and communities service missions of research and educational institutions and organizations.

It is in the area of the research mission of research and educational institutions and organizations that the impacts of networking have been most felt to-date. Indeed, access to network connections and networked information have become singularly essential for attracting and retaining researchers and the sorts of projects and funds that such researchers represent.

The long-term opportunity that networks present to the research mission is their enabling of a very much improved 'context of work' for researchers and for their projects and programs. This new context of work can already be glimpsed in the human genome, global climate change, and other research communities that work in what have become known as "collaboratory" environments. These environments support access to and interactions among three resources that are fundamental to every researcher, research project, and research program: people (theorists and empiricists, experts and novices, local and remote, and so forth); types of knowledge (theories, primary data, findings, commentary on theories and findings, documentation, curricular materials, and so forth); and formats of knowledge (text, graphics, sound, photos, animation, moving pictures). The immediate, even intimate, "co-presence" of types of people and types and formats of knowledge in Internet communities, coupled with the rapid and frequent interactivity enabled by basic Internet technologies, yields a context of work in which ideas and facts flow so widely and with such little resistance and such high resolution hat productivity rises to much higher levels and knowledge accumulates at much faster rates than here-to-fore attained or even imagined.

The long-term threat that networks present to the research mission is their enabling of effective and sustainable communication among researchers in ever smaller research specialties. This is, of course, perceived as an opportunity by the researchers who practice those specialities. The concern arises from the real possibility that the decomposition of research problems into progressively more esoteric research programs and projects will fragment human knowledge to the degree that the use of research outputs and the funding of research inputs will be compromised to the degree that the whole research system is destabilized. Research and educational institutions and organizations and disciplinary societies must devise new strategies for ensuring the relevance and coherence of research in the networked environment.

The impacts of networking are just beginning to be felt on the teaching and learning mission of research and educational institutions and organizations This is the area in which I believe the most exciting research and educational networking break-throughs will occur over the next five years.

The long-term opportunity that networks present to the teaching and learning mission is their enabling of a world in which 'immersion' is the normal rather than the exceptional student experience. We now have within our grasp the technological means to construct learning environments that have the information density of an ARL library (indeed, of the information density of the sum of all of the ARL libraries) and that also have the excitement and holding power of a videogame. Networked learning environments of this sort promise that each and every student will be able to marshall faculty, library, laboratory, and other resources at her or his own pace according to her or his own schedule and in a setting of her or his own choosing and of close contact and cooperation with other learners.

The long-term threat that networks present to the teaching and learning mission is their enabling of institutions and organizations other than existing research and educational institutions and systems to offer advanced, certificated teaching and learning services to the public. This will, of course, be perceived as an opportunity by the public. Let's refer to this as the "Charles Whittle" insight. It is also a vision that is articulated in alarming, if not completely compelling, detail by Lewis Perlman in a recent book entitled *School's Out*. This threat can be summed up by saying that networks are certain to create a much more competitive marketplace for teaching and learning that research and educational institutions and organizations have faced to this point, and that in this new marketplace research and educational institutions and organizations will not only be competing with each other. Success in this new marketplace will require research and educational institutions to become more student-centered, less dependent on keeping students in residence, and less devoted to granting degrees than they have been to date.

The impacts of networks on the community service mission of research and educational institutions and organizations are already very real, but they are also very uneven, reflecting the wide diversity of the communities in which research and educational institutions and organizations are situated. But the research and educational community can take justifiable pride in the fact that many research and educational institutions and organizations and people affiliated with research and educational institutions and organizations have already taken the lead in establishing "civic networking" projects that offer the benefits of networking and networked information to the residents of the community in their area.

The long-term opportunity that networks present to the community service mission is their enabling of the easy and regular flow of ideas and information that is necessary for the identification and management of the sorts of interesting and appropriate activities and initiatives that bring research and educational institutions and organizations and their communities closer together. In some cases these activities and initiatives will arise from concerns about economic development, in other cases they will arise from concerns about elements and secondary education, and in still other cases they will arise from a desire for expert knowledge to be applied to some community problem or objective ... solid waste disposal, zoning, and the like. Networked communication allows ideas and proposals to be brought forward, discussed, and disposed in a very much more responsive fashion than has generally been the case to-date, and this responsiveness fosters the trusting, positive attitude that is essential to productive relationships.

The long-term threat that networks present to the community service mission is their enabling of a situation in which immediate, concrete community interests could overwhelm the capacity of research and educational institutions and organizations to frame and address such interests ... an instance of the "insurmountable opportunity" syndrome. Community service is only one of three missions of research and educational institutions and organizations, and it is important that research and educational institutions and organizations pursue the other two missions in a manner that is relatively free of the immediate, concrete interests of any individual community. Research and educational institutions and organizations need to find ways to use networks to improve communication with community figures and about community interests, without assuming an inappropriate stance of "general accountability" to those leaders and those interests.

It is time for me to close. Without further ado, I leave you with the leadership principles of Charles De Gaulle, principles that I believe have particular relevance to the leadership that I submit the research and educational community must show and is prepared to show in the development of national, even global, information infrastructures.

Never lose the initiative.
Embrace the inevitable.
Stay in with the outs.
Never get between the dog and the lamppost.

Thank you very much for your kind attention.

PROGRAM SESSION III

THE ISSUES AND TECHNOLOGY

INTRODUCTION

James Neal
Indiana University

MR. NEAL: I welcome you to Program Session III, "The Issues and Technology."

This morning's session helped frame the debates and the stakes. Since this new communications highway has the potential to radically change the environment in which we live and work, it is imperative that we identify and address the policy and technology issues that influence the developments that take place.

Over the next few years, decisions will be made that determine the fundamental characteristics of the infrastructure. Consequently, it is important to define the strategies that meet the needs of the research and education communities in this emerging infrastructure.

The two presenters in this session will explore different facets of this emerging infrastructure -- the conversions of technologies, the new strategic alliances under development, such as Bell Atlantic and TCI, and pressing information policy issues, such as intellectual property, privacy, and access issues that are exacerbated in this new electronic environment.

Following their presentations, there will be an open forum, a town meeting, if you will, focusing on the various issues as they relate to and affect the research library. Please bring to this town meeting the questions that have come up in your minds over the course of the entire day.

My name is Jim Neal, Indiana University, and I will serve as moderator for this program this afternoon.

One of our two speakers is Richard Taylor. Richard Taylor is professor of law and telecommunications study at Pennsylvania State University. He currently serves on the University President's Advisory Committee on Telecommunications Infrastructure and is chair of the University Information Technologies Interest Group. Prior to joining Penn State, he was the vice president and corporate counsel for Warner Communications, responsible for cable television and new media markets.

I would also like to welcome Rick Weingarten back to ARL. Rick is the executive director of the Computing Research Association (CRA). Before joining CRA, he was manager of the Communication Information Technologies Program, at the U.S. Congressional Office of Technology Assessment (OTA).

Under his leadership, OTA produced a number of excellent reports on issues relating to privacy, access to government information, supercomputers, and networking issues.

He has served on advisory committee for the National Science Foundation, the Department of Defense, and the State Department.

CONVERGENCE AND HIGHER EDUCATION

Richard Taylor
Pennsylvania State University

MR. TAYLOR: Thank you, Dean Neal. Good afternoon. I have not felt so welcome since I spoke as a representative of the cable television industry a few years ago before a convention of the telephone industry. It gives you sort of a warm feeling.

I do want to very much thank Susan Nutter of ARL for inviting me here to join you; I am honored, and it is a privilege. I fear, however, that before I am done, you may conclude that I am something of a rude guest.

I have been given license by our moderator to make you angry. I would, of course, not go that far, but I may be just the tiniest bit disappointed if, by the time I'm done, I have not generated at least a little bit of the FUD that we heard about earlier -- fear, uncertainty, and dismay would be a nice description.

There are some advantages to having been associated with what was referred to earlier as the criminal cable television industry.

When I knew that I was going to be speaking here, I was trying to think of something that would really forcefully bring to your attention this whole idea of convergence. So about two weeks ago, I called up my old friend John Malone, and I said, "John, I'm going to meet this group, I have to speak about convergence. What can you do for me?"

There you go. That's how it happened. The rest is history.

What I would like to do is tell you a little bit more about myself, because I think buried in some of my own history is at least one substantive message about all of the things that are going on.

Then I will spend a little time framing the discussion of convergence and move on from there to how, from my perspective, it may affect higher education in general, and work my way from there to libraries, and research libraries in particular, leaving you with a few ideas on my vision, at least of alternative or additional policy directions that you might be thinking about.

In my career, prior to coming to Penn State in 1989, I worked at one time in the telecommunications industry, in a broadcasting company, and finally resolved myself in a media and entertainment company, because Warner was a great deal more than just cable television.

Along the way I was the counsel for a project that was known as Cube Cable. Some of you may have heard of it, some of you may not, but in the late 1970s and early 1980s, we offered a cable television system driven by what was then a very high-tech computer, which offered many, many kinds of interactive services -- home security, home shopping, home banking, the entire panoply of things that you see being spoken about in such glowing terms today.

We lost a ton of money on that and closed it all down. I'm not sure what the moral is there, except that people are proposing now to spend enormously greater sums of money to bring you essentially the same thing. There is some room for consideration of who is going to pay if all of this doesn't turn out to be such a great idea and if the market for these various services doesn't turn up.

I also spent a considerable amount of time working with strategic planning. I worked directly with the senior vice president for strategic planning. I have to tell you, seven or eight years ago we were looking at the kinds of issues that are turning into realities today.

I'd like to start off with just revisiting a word that we have heard a lot about, which is convergence. The idea of the convergence of technologies as an engineering concept has been around for quite a long time. I can remember reading an article in *Scientific American* in the early 1970s, talking about how communications technologies could all come together.

It was not, however, packaged as an industrial strategy, to the best of my knowledge, until about ten years ago, when it occurred to Akio Morita, then chairman of the Sony Corporation, that he was working with something special that was going to have very broad-gauge implications for his company.

The vision was that semiconductors were not just pieces of computers, but they were building blocks that you could use in any number of pieces of equipment or technology, and that the binary language was one that was not, again, just for computers but a universal language that could be used to connect any number of electronic devices.

He then steered his strategy for Sony Corporation in that direction, which you have subsequently seen covering a wide range of electronics. He saw that this convergence of technologies was going to bring several industries together -- telecommunications, communications and media, consumer electronics, and computers.

Mr. Morita knew Steve Ross, my late boss at Warner Communications, very well. When he came to New York he would sometimes stay at Mr. Ross's apartment. I was, unfortunately, not invited to join those conversations, which was, I'm sure, an oversight at the time, but I suspect that along the way some of this flavor was translated to Steve Ross, and he was among the first American leaders of major media corporations to begin to appreciate the real potential for this convergence.

It has subsequently been picked up by other leaders of these industries.

This first overhead was one that was produced for Apple Computer, and I picked it up from an article about John Sculley. The timing in using this on my part may not be exactly perfect. As you know, Mr. Sculley is no longer with Apple, but you get the drift.

I'm trying to provide you all with the framework, and you can see what these media moguls are thinking.

The 2001, An Information Odyssey, is a listing of four industries -- computers, consumer electronics, telecommunications, media, and publishing -- as essentially one industry that his company was going to pursue in what he called The Three Trillion Dollar Information Megamarket.

Mr. Sculley, I think, felt that this was probably an unduly complicated way to represent his vision, and so he was looking for some smart people. He knew where to find them, and he went out to M.I.T. Sculley said, "Could you help me sort this out so I could explain it to the people more easily?" They said, "Sure, we can do that."

Here is essentially the same thing for a more academic audience. Divide it however you want, and you can look for libraries. It may be in Information Vendors. I understand the vending business; there's a lot of cash flow, so that may be very good.

But, conceptually again, our idea is from the point of view of the guys running these big companies. This is all now one big business, and you have to be in all of that, if you're going to be one of the survivors. You are not just in a piece of this. You have to be in the whole thing, if you can.

That came back from M.I.T. and then circulated around. He said, "Well, these guys are pretty smart; you know, maybe you ought to pay attention to them."

"We can do that."

This is one of many possible examples of the kinds of alliances that are being made, which are the analogue in real terms of that rather complicated and convoluted chart.

This does not include the Viacom deal, this does not include Bell Atlantic-TCI. You could draw any number off the charts.

What you have emerging is the clusters of interests. Time-Warner and U.S. West, Paramount-Nynex, Bell Atlantic-TCI, AT&T-McCaw; people who are big enough to cover the waterfront with respect to these issues. Then they form partnerships and joint ventures with each other and with subsidiaries and so forth.

This is an extremely complicated web of relationships -- where you have spheres of influence of dominant players.

This is to say that, although the Bell Atlantic-TCI deal came down truly as a surprise to virtually everyone but the insiders, the trend, the underlying forces that drove that deal, have been perfectly visible for some time.

So, in a sense, if it wasn't that deal it would be another deal, and if it wasn't last week it would be next year or some other time, but it is not a coincidence that that deal came down. It's a reflection of much larger economic and technological forces driving this whole area of industry together.

What you have in this case, as we are now presenting with the Bell Atlantic-TCI deal, and, of course, we have to now confront what our telecommunications policy is going to be, is that they are proposing a new competitive paradigm. Instead of the old paradigm where you would have telephone companies within their service areas competing with cable companies in those service areas, you now have a shuffle paradigm where you have vertically integrated media and telecommunications corporations competing on a national basis.

Again, there is no indication in the long run, no proof nor solid reason to firmly believe, that there is ultimately going to be a market that will support that competition, but not too many people are paying attention to that issue at this point.

I would like you all to keep open the option, which the first time I saw recognized, I believe, was in yesterday's *Wall Street Journal*, that in the long run we may be back in a one-wire world, notwithstanding all this wonderful talk about competition. There are still people out there who think that that makes a lot more sense, and they believe that history is on their side.

That gives you, of course, an entirely different view if you're looking at a regulatory perspective of what you want to do than if you have a working competitive marketplace.

Will this deal, this vision of the market as proposed by Bell Atlantic and TCI prevail? And if it does, it will almost certainly be followed by similar ventures and mergers and combinations, because everybody else in this business is going to be pretty much forced to do the same thing.

The idea, the answer, so far as I can see at this point, is almost certainly yes. Why do I say that?

I say that because I simply do not see the opposition shaping up. It may have been there a couple of years ago. Traditionally, the cable industry was opposed to telephone companies getting into video. The newspapers have made their peace, basically, with the telephone industry. The broadcasters are silent.

The kinds of partners that you would need if you wanted to really put a stick in the spokes of this deal do not appear at this point to be there. What I see is Senator Metzenbaum, a man not afraid to stand alone, and doing it, I suspect once again or close to it, I see some consumer groups. I see state and local regulators who fear they're going to get preempted. I maybe see the unions, depending on how things go.

The cable television industry, historically, is a nonunion and, indeed, an anti-union industry, and that will be of concern to the communications workers. But at this point, with all due respect to your very able representation, I don't see the kind of coalition forming that would put any kind of serious brakes on this deal.

The administration is leaning toward it, the FCC is leaning toward it. I haven't heard anything from the antitrust division. It looks, at this point, like it's going to go ahead.

From your point of view, you will then have communications policy driven by telecommunications companies who have their own ideas of how they should get paid and how the economics of their system should work.

And you will have edutainment companies, which also like to get paid for each and every use of their intellectual property. That may well be the worst of all possible worlds from the point of view of some of your policy objectives.

In terms of the High-Performance Computing and Communications Initiative, and NREN and Son of NREN, and various permutations thereof, it doesn't look as if it will be stopped, but I suspect that it will ultimately be overwhelmed in terms of the commercialness and the structure of the operation of whatever the ultimate system is going to be.

I am happy to see groups like yours becoming involved in the public policy debate. I think it's very helpful. People like Prue Adler are very effective. You have your hearts in the wrong place, but I think so long as you're out there for the public interest, that's good. Except that you're standing alone, which is almost always a loser in Washington politics.

I just say that to be encouraging. I've been doing this for a while. I'd send to you Henry Geller or some other people who have been in public interest communications law for decades. They're wonderful people and have made some inroads but probably haven't made the river run upstream very often.

What I think you have to do is connect yourself with some more mainstream causes and talk about the value that libraries add to economic growth, recovery, to international competitiveness, to the defense builddown, to integrating a diverse society in a peaceful fashion. Very subtle, that one. We'll have riots if you don't give us money, in addition to the kinds of public interest rationales that you have been putting forward.

How does all of this play against higher education? My favorite analogy in this respect is a man on a very small desert island in the middle of the ocean sleeping, and the water is all around him and there are sharks sort of circling in the water, and if he stays asleep, he will surely be eaten by the sharks.

What I like most about the analogy is that if he wakes up, he will probably still be eaten by the sharks.

I have to introduce you to a different view of higher education and a phrase that is gaining some currency, which is the Learning Enterprise. It is a nice way of sweeping together all of K through 12, higher education, industrial training, executive development, and the world of what we call in the biz edutainment, which is a big biz.

As one of the people in the biz said, if anybody thinks that education isn't edutainment and edutainment isn't education, they don't understand either one. Think about that.

But that is the perspective. It also detaches itself from the idea of education, which is perhaps focused to the idea of the learners, who go into the system to find what they want.

At any rate, whether you like it or not, you are all now part of the $700 billion Enterprise market, and that is how it's being looked at in the circles of people who run $30 billion companies and need to grow 10 percent a year and have to go where the money is. That's one of the places they need to go.

That is what Steve Ross had in mind. He made a little-reported speech several years ago. He said that by the turn of the century, or shortly thereafter, he expected the majority of all education in this country to be provided by corporations like Time Warner.

Now as you know, Time Warner hired Benno Schmidt away from Yale. They have Chris Whittle's little project. They have now learned, I think, that the future growth of the Learning Enterprise is not in the classroom, not in the box but out of the box, and it is delivered at home and in the workplace, or anywhere, any time, and that is a lesson that they are learning real fast and that higher education, I think, will either learn real fast or find that it has a lot of competition at its front door.

To give you an idea of what drives that, we had a report we delivered by the Pennsylvania Utility Commission earlier this year on the telecommunications infrastructure in Pennsylvania. It was done by Deloitte and Touche, the accounting firm. They did some market research to support their recommendations, and they held focus groups of consumers, and they asked them what they would pay for various services delivered by some system similar to the one we have heard described here in various forms.

While these kinds of data are always somewhat dubious because people don't always do what they say they'll do, they give you an idea of what may catch people's attention in the business. On a monthly basis, the average respondents said they would pay about $5.50 for movies on demand, and they worked their way down from there through health care, home shopping, home banking, radio, and a variety of other services, down to about $2.25. That was the range of what people said they would be willing to pay for home-delivered services on a monthly basis.

They asked them how much they would pay for long-distance learning per month. The answer was $12.50. Both encouraging, perhaps, and discouraging, if you think about it. So there are serious incentives. I don't think you have to worry about whether there will be a system built that will be capable of delivering educational programming.

I predict, fairly safely, that it will. Obviously, there are issues that won't address the homeless and other things, but if you look at a broad scale, many people will have availability of a system that will deliver learning experiences any time, anywhere.

The question is, who will be delivering them? It may not be the traditional sources, the way things are going.

Where, then, does this take a particular university? Let me use Penn State as an example. The moral in the story works for everybody in a certain way, either positively or negatively.

If we want to have a major expansion in the delivery of our educational programs to nontraditional, nonresident audiences, which, in principal, I think we would like to do, we need a lot of production, we need packaging, we need marketing, we need distribution, we need promotion, we need a lot of things that cost a lot of money. I don't know about the rest of you but we don't have much, and I suspect that's fairly common.

What do you do? You find a partner. You find one of these large strategic partners, and you say, "Hi, we have a brand name product. We are Penn State, we are Michigan State, we are Harvard, we are whoever we are. We want to make a deal, you package it, you distribute it."

This will both give you a new product and increase the usage of your system for distribution, and they like that. Let's get into this undertaking -- sort of an apt word, isn't it -- together.

So what you may have, if you let this be driven entirely by the economics, is a situation where you develop a certain number of potentially global, slickly packaged, well-marketed, mega-universities, and the rest of the folks.

What that means for the vision of higher education, what that means for the idea of what learning is about, are questions that I hope you will all start giving some thought to because you may find yourselves addressing them in that context sooner than you think.

Moving on to libraries in general, and research libraries in particular, it seems to me, and I certainly come here as no expert in libraries -- I don't want to mislead you. I do have a connection to a library. My office is in Room 201 of the Carnegie Building.

The Carnegie Building was built about ninety years ago as a library, so don't think I don't know anything about libraries. It's a lovely building. I have advised the current dean of libraries not to rent out all her space yet, to sort of hold that for a while.

It seems to me, as I think about the Carnegie libraries and the public libraries, the reasons for libraries are still there. You need an educated work force and citizenry. You need to support students.

You need to provide for support of the activities of scholars. Those things have not changed. The functions that libraries perform will not change. There will still be opportunities in those regards.

Here are some particular areas that it seems to me are continuing applications, not all of which I expect to thrill you to the bone.

The first of these, however, is the fairly obvious: If we are going to have a world in which all recorded knowledge is in digital form, somebody's got to do that, so you can look forward to many hours, standing at scanners. I don't know how they plan to do this. This is a long-term job.

You may find friends in this regard, too. Companies like Xerox and Kodak, and people who are into imaging and storing information and so forth, because this is not only a long-term job, it's a heck of an expensive job, and I'm sure you're all way ahead of me on that.

It would be nice to have everything in a library on a big disk somewhere. Figure out what that costs. Not inexpensive.

Also, what is almost a cliche at this point, but what I think works, is the idea of being the knowledge navigators, the people who can sort through and direct and guide people in respect to all of the staggering volume of information that supposedly will be available. That will be a hard job to replicate with a software program, although people will be trying, providing, at least in some cases, community resource of access.

Before if you were poor and you couldn't buy a book, and you wanted to read the book, you went to the library. Now if you can't afford the computer, where do you go? Maybe you go to the library. Maybe the library of the future looks more like a computer lab than it does anything else. That means you've got some structural redesigning to do. I understand, in fact, some libraries have already proceeded along those lines.

Finally, libraries have a role as an aggregator and broker of intellectual property rights because these are complicated issues, complicated economic issues and not likely to be dealt with on an individual-by-individual basis. So there's probably going to be a lot of wheeling and dealing.

In terms of our library at Penn State, we look at libraries, at least I do, and I know it's a view shared by a significant number of people, as being one of three integral parts of any movement into the future in terms of extending our land grant mission outside of the walls of the university and to new audiences.

The three parts, essentially, are the Distance Learning folks, who help put together teams to devise and package programs and courses; the computer and information folks, who serve a staff function in the library, but who are equally integral. They're the ones who know how the stuff works and can put it together. The third are the libraries, who are the information support resource, and they are units that work across the university for all of the academic units.

In that sense, they're very efficient and relatively easy to yoke together, we hope, to make some progress.

I think that this is not meant to be an exhaustive list. This is a rapidly evolving area. Opportunities will show up. I think you have, as libraries, continuing opportunities.

The director of admissions has asked me if they should consider selling the building. I said no. I suggested that we don't lease out the library yet. I think a lot of things have yet to unfold.

If you keep working hard and keep looking at these opportunities and take more aggressive postures in the public forum and are prepared to change, are prepared to take on partners and to lobby, emphasizing the broad social benefits of what you do, I think you have a bright and significant role to play in the Information Society of the future.

TECHNOLOGICAL CHANGE AND THE PUBLIC INTEREST

Frederick Weingarten
Computing Research Association

MR. WEINGARTEN: I don't come here with many answers — with any answers, as a matter of fact. I hope I can raise some questions.

I would like to spend my time stepping back a bit. Since I'm from the Computing Research Association, I'd like to step back to the technology and technological change, and try and get at where some of these policies are coming from, and some of the problems that we're focusing on here. That was the assigned title of my talk: "Technological Change and the Public Interest."

Of course, the first thing we have to do is to ask what is the public interest; what do we mean by public interest. Not being a lawyer, not being an economist, and certainly not being a regulator, I can only speak as a technologist.

But it seems to me, traditionally, we have a set of values that we've applied. We've talked about universal service, which means a wire in every home, a wire at every desk, whatever.

In broadcast media, the public interest is maybe a little more diffuse and issue by issue. But certainly when Janet Reno testified concerning violence on television and asked for voluntary control or there would be legislation, she was, in fact, talking about public interest and the content of television.

We've had legislation on children's television, we had a fairness doctrine for some time on broadcasting, so there are various expressions of public interest.

Somehow the term "universal service" seems to have been given a little more coin, at least that's what I hear out of the National Telecommunications and Information Administration (NTIA) these days. Probably because the mental model that people are using for this new infrastructure, whatever it may be, is the telephone system — some augmented telephone system.

But, basically, since I don't know what the infrastructure is going to look like, and I don't yet know what the public interests are going to be with respect to that infrastructure, I'm going to leave you with questions before the answers.

Certainly there's a driving rhetorical force behind the infrastructure these days. If you listen to the administration, it is economic.

The total industry, according to some numbers out of Harvard, may be around a trillion dollars this year. Somewhere roughly in that area. I don't think that includes the garbage stuff, professional football and so on, that used to be added into the information economy. That's really, basically, the computer companies, the telecommunications companies, and the broadcast industry.

So the stakes are very high. It's not unreasonable for the government to think that this is of public interest. It's a huge industry. It makes these decisions very important and it also makes them very difficult. It makes it politically very intense. There are large bucks involved here — potential bucks in the future, potential bucks now with investment.

I think it's quite right that the pressures and forces of these industries, jockeying for a position in the market, may tend to overwhelm other groups holding up their hand and saying, excuse me, there are some other interests that we need to express here.

Linda Garcia, who works at OTA (Office of Technology Assessment) still, and worked for me at the time I was there, found the following quote from John Dewey:

"That society not only continues to exist by transmission, by communication, but be fairly said to exist in communication. People live in a community, a virtue of the things they have in common. Communication is a way in which they come to possess those things in common."

In other words, there's something deeper going on here. This is not a toaster, as a past chairman of the FCC, was wont to say time and again. I didn't quite understand what he meant by that, but he kept saying communications is not a toaster.

I suppose what he meant is that there's really minimal federal interest in it. If the toaster industry goes out of business, we have a little more pastry at breakfast or something, and that's about it. There's no great compelling public interest in the toaster industry.

There certainly is compelling public interest in what's going on in communications. That's because our entire society, our politics, ourselves, our social organizations depend on how that system works.

That's what we use it for. We use it to relate with each other as human beings. So there's bound to be some form of public interest in this.

There are several layers of policy issues, and I really plan to focus on just one. This is a model I've used in the past. The basic, infrastructure-level policy. Policy that guides the development of the communications system as we will know it and as we use it.

Information policy is what governs the stuff that goes over that infrastructure. It's like privacy. Intellectual property.

Users and uses. How the stuff is used. The way various segments of society are affected by it. At OTA, we did studies of banking; we did studies on financial markets; we did studies on education, on libraries, and so on.

We looked at how different use by communities in our society would be affected by changes in the infrastructure.

Finally, something that I think the political system doesn't generally worry a lot about is this fourth level. We only did one study like that at OTA, in which we tried to look at the Constitution and the nature of our political system and our society and how the change in technology of computers and communications might change how that democracy works. That's not something you hear much of in these policy debates.

I'm going to focus on the infrastructure level now, partly because that's where the decision making is taking place, and partly because user groups, like the ARL, have not traditionally been very involved in those questions. They've been really focused on the impact of technology in libraries, intellectual property, privacy, and the other information concerns that libraries have.

But there's a reason why we have to start focusing on infrastructure, who's going to build the system, and what it's going to look like.

Let me go back into history a little bit. Anybody here who's a communications engineer is going to find this an extremely oversimplified and probably, in some ways, erroneous model, but let's just look.

The old telephone system had individual units, most of which looked the same; a din of wires, and we all went through Bell, into this switch, and the communication paths would be determined through the switch. The phone company owned, up until the 1980s, everything, including the telephones. This was all an internalized system, highly regulated and given to us by a monopoly, more or less.

Then along came ARPA (Advanced Research Projects Agency of the Department of Defense). Again, this is over simplification, but I'll blame ARPA. They leased some lines from the phone company. They just got some telephone lines, some raw lines, and they put their computers at the ends of those wires.

They developed a system by which they could communicate with each other by sending digital packets of information along those lines, in which all the switching and all the control was placed at the ends within the computers.

The packets had little addresses on them. One computer would look at the packet and say, "Oh, that belongs over there, I'll ship it down this line, I'll ship it over here, I'll ship it over there." It removed the phone company as a central player.

Now that's where the first real convergence of computers and communications came.

Now the effect of that, because computers are now controlling the switch and controlling the flow of information, is to bring intelligence into the system. Intelligence, in the sense of the ability to do more data manipulation on this stuff as it flows through the system. One can translate it, change formats, even do more complex sorts of things.

It puts the control at the endpoints rather than in the central switch. The endpoints are owned by the phone company. That's very disturbing to me.

It blurs the lines between the transmission of data and the transmission of information and the applications that might be laid on top of it.

In fact, what we're working for, or toward, is what you might think of as a layer cake. Now communications technologists use the concept of layers. They have a very complex multilayered way of describing the protocols and standards, and this is sort of based on that. But it's more of a description of the way the industry is evolving.

At the bottom is a physical infrastructure of the wires, the switches, and so on.

The middle level is basically what ARPA did. The packaging of the information in different kinds of ways to provide different kinds of new services at a fairly basic level, and then laying on top of that a lot of applications — bulletin boards, all kinds of very specialized applications, laying on top of these various kinds of data configurations, laying them on top of the physical wires and infrastructure of the system.

One of the things you can see out of this model is the dilemma we have in dealing with this convergence, merging of industries. Different firms, different companies are providing this, so it's not a monopoly system.

But, on the other hand, what we have to do, if we really want a $400 billion or whatever investment, is for these guys to merge. They're going to have to bring their capital together to do that.

Second, they're going to have to bring their visions together, because if this person says, "Well, there will be an ISDN; that's the wave of the future," and starts investing in that and the physical infrastructure; and if this one says, "Well, one-way megabit communication is it because we're going to be pumping high-definition TV down the line, but nobody is going to want to say anything in return;" this one says, "Well, it's a two-way, high-speed data communication, on optical fibers and so on," we'll never get an infrastructure.

Again, they have to merge vision. They have to merge vision, and they have to merge capital. So there seems to be a driving force here to pull these together and even a driving need to do that for public policy purposes.

At the same time, if these are merged together, if all of the applications and all of the information services and so on have to flow through this, you've got a single-gatekeeper situation again. The gatekeeper controls the flow of information in our society — everything.

All flows through this. So a great deal of public concern arises over this kind of merging. Especially if they not only merge horizontally but start moving vertically, which of course they are, because this gives an economic incentive to start restricting the flow, restricting access down to the lower levels.

So we're faced with a real dilemma in our society right now. We want some of that to take place because we need to have it, or at least I haven't figured out how to get where we want to go without it. At the same time, it presents a very dangerous scenario of concentration down the pike.

The new character of this NII, whatever it is, makes for a great deal of policy stress, such as merging of services and antimerging. There's convergence, but there's also a great variety of services and communications systems.

The fact is that change is permanent and that access is not access. I'll ramble through some of those statements here.

In the first place, a confusion of roles — a user or a provider. It used to be very simple. The telephone company provided the telephones and the rest of us used them. That was a very simple model. It's not so simple now. It's a university that operates a local area network and is a member of a regional network, and so on — a provider or a user — it's the local library, or a set of libraries that put together a small network within their community. Are they providers or are they users? Well, they're both.

Believe me, that's been a real problem in dealing on the NREN issues with the phone companies, because the phone companies still see the world as divided in that way — there are users and there are providers.

What's a network? Is a network the physical infrastructure — the wires, and dishes, and so on — that make it up, or is the network the logical connections that are built on top of that?

Librarians have used the term "network" for decades to describe communities and organizations. That's a network. We use the term in Washington — networking. What is a network and how can we talk about the network, and what is the infrastructure; where do the boundaries of the infrastructure end?

I won't go much into the merging and antimerging of services — telephony, broadcast, data transmission, cable, new media that we haven't even thought of, new uses for the system. They're all going over, maybe the same wire, maybe a couple of wires. But they're certainly all being pulled together into the same infrastructure.

There's a tremendous variety in the infrastructure. Remember, the telephone system of the past was pretty uniform. Whether you were the president of General Motors or a poor person downtown, you basically had telephone service into the switch network. That was the basis of the universal character of that network.

Now the communications system is starting to fragment and diverge into a great variety of services, ranging from extremely high-speed data communications to very low-speed and very simple communications, from portable, nomadic telecommunications, to wire-bound. That's the density of the fabric.

We're building networks that have very few nodes at a very high speed, and other networks that are very dense and they're switching at a slower speed.

And the basic architecture of the packets. They are only ways of configuring data communications on a network.

There is a great variety of resources and services, many of which, as I said before, we haven't even thought of, and a tremendous variety of providers, moving away from that monopoly or even oligopoly system.

We had three broadcast networks a while ago, we had a telephone company; now there are hundreds of thousands. If you think back to that layer cake model, up at the level of information services, it's just infinite. It's going to be a bazaar, where anybody can open up a shop and offer some sort of information service. This is not a monopoly, at least at that level.

Change is permanent. I don't mean we're changing to some other permanent state. I mean the fact of change in technology is, in fact, permanent. So there probably is no NII. There is no ultimate goal, because every time you turn around there's some new technological capability, or we've found how to pump more bits down a wire in an existing system. We've invented some new way of transmitting information or of using it.

Whatever policies we adopt, then, cannot be defined in terms of a specific, fixed image of what that system is going to look like in the future. From now on, change is permanent.

Changing social dependencies. What is a toy these days, or maybe a necessity for a captain of industry, is going to be, ten or twenty years from now, a basic necessity to live in our society.

Just think in terms of access to the financial system, where now it may be accessed through an ATM or through an electronic payments mechanism. This may be an optional service now, but if we decide sometime in the next decade or two to provide social welfare benefits over that system, or provide benefits for a universal health care system over an electronics payment system, everybody will have one of those cards that Mr. Clinton waved during his speech.

So, over time, even the definitions of what people require to live as citizens in our society will change and evolve.

Finally, access is not access. Again, remember that layer cake model. Access to the physical infrastructure is nothing if you don't have access to any of the services and databases that are on it.

In the past, access to the telephone network was, in fact, access to the service by the telephone network. In this case, we detach those two things -- services from the network itself.

So that the means that the traditional regulatory regime was tremendously stressed. It used to assume there were clear lines between providers and users; it used to assume that it dealt with at least a limited number of providers, so you could at least think in terms of regulating it.

It used to assume that media matches the use; that when it dealt with the telephone system, the service it was dealing with was the telephone system; in broadcast television, the service was defined by the technology. This is no longer true.

At least in the case of telephony, the public interest is somehow subsumed under the term universal service. Make sure everybody gets a cheap wire to the home, and that solves the problem of the public interest.

What is the public interest in this new regime? Well, that's the problem. There will be a hierarchy of services, that's for sure. We're no longer in a world where the president of General Motors has the same needs for a telephone as any individual citizen.

There's a hierarchy of services and a hierarchy of needs, and that's going to be the reality. For instance, think about a spread spectrum: a secure communication medium for the Defense Department or space net for NASA, to a range of services, like cellular telephones, which are in no sense universal, but in fact are widespread and probably economically and socially important in many parts of our society to something, whatever that may be, that we really want everybody to have access to.

That hierarchy is a fact of technology, a fact of technological life. Policy questions are one of the tolerable boundaries here. What can we accept as the range?

If everybody doesn't need a gigabyte connection to a supercomputer, and I think we will generally accept that that's probably true, what do they need? What range of possibilities are we willing to accept?

Again, from the change-is-constant argument we need to adapt definitions to policies. If we take the universal service route to define the public interest, we need to have underlying principles and a process by which, as the years go along and as technology changes, we move things in or out.

That's why I personally think it may be an underlying assumption that universal service really doesn't work as a concept for the NII, but it's what is currently being talked around town.

Finally — well, not finally — diversity is a social goal, a universal goal. So the assumption of universal service with a telephone system was that we all wanted to do the same thing; we all wanted to be tied together as a society. But if you look at, for instance, how people are using the Internet, the most exciting stuff that's going on on the Internet at the grass-roots level is diverse groups forming their own communication paths.

The nets serve as bulletin boards, they serve this interest in this group and that interest in that group, and that is good. There are people who worry about whether or not, if we're allowed to balkanize ourselves completely that way, we'll still be a society. So there's some tension in there.

But whatever universal service or whatever the public interest is in the future, it's going to have to make room for this kind of very diverse use of the system by people; the finding of their own special interest and their own special ways of using this network to tie their communities together.

This is the finality: new roles for information institutions. Of course, libraries are defined as information institutions. I also define schools as information institutions, but whenever I do, I get attacked. Schools don't think of themselves as information institutions. I don't really know why, but they get quite offended with the term; but certainly libraries understand themselves that way.

Information institutions are, by most definitions, part of the infrastructure. They're not users of the infrastructure. They don't sit separate from the infrastructure and worry about what they're going to do with it. They're part of it. They're part of the game.

The questions are not how could we use this new infrastructure, or what are the business opportunities in this new infrastructure, but what roles are we going to play?

I heard at a forum I was at the other day, some people asking, "Is there a future for libraries if we're going to replace books?"

If the technology does anything, it's going to magnify by orders of magnitude the flows of information in our society and our need to access those and access them in usable ways, and that's what libraries are about. They're the institutions that help us delve into this information stream.

Technology is going to help them. The knowbots, the artificial intelligence databases, the recording languages, and so on are going to be there as tools. But they're going to be tools for the library community. Libraries are going to need as many tools as they can get their hands on because it's going to be an enormous, a massive job — a massive role to play.

I am not so concerned about the problem of converting information. That's probably because I'm from the research side, and to the research community, most information now of use is produced in digital form. It's not a question of converting.

As we go on through the next decade, most of the information any researchers want to get their hands on quickly is already going to be in digital form.

As we go back into the archives and need to convert as we go along, we can do so, but I don't see that there's any need five years from now to have an entire backlog of human printed material on line. That's simply not the objective here, not the game; it's not a useful exercise.

So those are my questions and issues. Like I say, I didn't have any answers. I'm told there's going to be a town forum afterward, and that there was a rather lively debate this morning that I didn't hear that may result in some questions, so I look forward to those.

TOWN MEETING

TOWN MEETING FORUM

James Neal, Moderator
Indiana University

MR. NEAL: As I indicated at the outset, one of the purposes of this afternoon's session was to allow us to bring our questions and comments from across the day to this town meeting forum. I'm hoping we can use this time to generate some questions and issues and get some good dialogue going about some of the problems and concerns that we bring to this topic of the day. I've noted down some questions that I have. I'll just throw those out, and then, hopefully, you'll pick up some of those themes and raise some of the questions you have.

First, I'm concerned about the notion that universities, particularly the research universities that we represent and the libraries that we work in, may out of necessity have to be seen as drawn into what Richard Taylor labeled the edutainment industry.

Second, is the role that was outlined by Richard the one that we see 10 years from now for the libraries that we manage; that is, retrospective conversion of our collections, digitizing everything, knowledge management, navigators, community resource access, brokers of intellectual property rights — are those the areas in which we see ourselves focusing our attention and our resources a decade down the line?

Third, does residential education have a future on our campuses, or are we going to be drawn much more routinely, if not entirely, into supporting a distance education program, which becomes the research university?

Fourth, is the library a toaster industry?

Fifth, are we making ourselves expendable?

Those are the questions that came up in my mind as I listened to the two speakers this afternoon.

What questions and concerns came up in your mind?

MS. CLINE: Nancy Cline, Penn State.

Rick Weingarten left us with new questions for libraries. I have one that wasn't on your list, and I'll address it to either one of you.

As we talk about the change — and I'll reflect on the images that Richard Taylor put up, with the new relationships among different industry players and so on — one of the things that keeps coming up in our discussions is with whom do we collaborate, with whom are we still competing — and I'm saying "we" the libraries.

Answering this either in the library context or the educational context, how should we define strategies to bring some of these contentious players, if you will, to the same table, so that we can develop more focus on the research and education applications of the networking directions that we would like to advance?

MR. WEINGARTEN: I'll only make one comment on that, and it is on the last phrase you used, "bring them to the table." Some of you know that we've been engaged in some discussions with the phone companies over the Boucher bill (H.R. 1757) and some of the language about the NREN, the Internet, and so on.

One of the things that struck me is how little that industry understands about how data communications is going, how the research, education, and library communities are using these systems.

I was told by a senior vice president of a phone company at the time, "Well, the only thing it's being used for is for students to make dates with girlfriends on other campuses and to access porno bulletin boards."

He said that quite firmly, he wasn't making a joke, and he's told members of Congress that.

What I had to tell him was that the last time I gave a speech to a group of mathematicians, the president of the American Mathematical Society came up to me and said, "Doesn't he understand that the entire mathematics community now does mathematics on the Internet? That's the way we communicate, that's the way we do our work on mathematics."

My answer had to be no.

I think it's very true that we don't understand the industry and the economics that are driving the industry, but there is a real gulf there that I worry about, so there is a need, I think, to "come to the table."

MR. TAYLOR: I certainly will concur that higher education and libraries are not near the top of the consciousness of the people who are designing this new information superhighway; and there is, of course, a double bind that Dean Neal suggested by his comments, lying beneath the surface of your question, how we find strategic allies: do you want strategic allies?

There is a price for this. The price is you may now be in the edutainment business. If you are willing to pay that price — and you have to consider what the alternatives are — there are a variety of contacts that I'm sure exist at all universities if you choose to focus in this direction.

First of all, seek out your own faculty and the research that they do, your own development officers who know where your alumni are, whatever you call that part of your university that handles government funding, and your organization within your universities that deals with whatever other kind of funding you may get if you're a state institution. Go to them and tell them that you are now focusing on the information technology area and you are looking for allies.

You have to find them. At this point, you're not going to find that too many who will come looking for you. You may find a few. They're starting to figure out that, as they look ahead to build the system and support it, they will need an enormous amount of traffic on the system.

Entertainment alone — *Beavis and Butthead* on 500 channels, actually — probably is not enough traffic to support it. You've got to put the whole health care system on this; you've got to put government communications on this; and you've got to put a lot of education on this, just to build that kind of traffic. You will gradually see people saying, here is a big area that we need to address, to determine how either our carriage industry or our value-added information product can relate to what these people do over here, and you have something to bring to the picnic. But at this point, mostly you have to go out and explain that to them.

MR. KOLBUNICKY: Paul Kobulnicky, University of Pittsburgh.

I'm just wondering — and I'd like to limit this question just to higher education for a second — to what extent, given the cost of investments and being a player, are we looking at a fundamental restructuring of the business of higher education, much in the same way the airlines have become restructured?

MR. TAYLOR: I'll take a crack at that.

Again, I don't come here as an expert in the economics of higher education, but when I got to Penn State, it was fairly clear to me that people there were not thinking about all of these alliances in the world outside the walls of the university. Yet they were speaking in many of the same terms, simply because of the changing demographics and economics of higher education.

They had already figured out that, with the demographics of the student workforce and the changing demands of the nature of work in the United States, that the growth rate may be flat. Resident education at this point may not be a declining business, but it's coming close to a flat business if you look at it in those terms.

You milk your stable, mature businesses and put your resources into your growth business, and it's clear, even to people who don't think about edutainment or anything like that, that much of the growth of higher education is going to be in non-resident, non-traditional audiences.

To that extent, I think higher education is headed for some restructuring anyway, because that's just the way it's going to go, driven by the economics of your market.

DR. WILLIAMS: Jim Williams, University of Colorado. Let me just add, aside from economics, the simple move of information and communication from paper to electronics itself, over the long-term, changes the nature of education because much of the structure of the education establishment is structured around the nature of books and the nature of paper.

MR. MOSHER: Paul Mosher, University of Pennsylvania.

What if we decide that these are not acceptable equations? That is, what if we decided that the equations of public interest equals profit; constitution equals economic interest; ideas equal market; learning equals entertainment; education equals commerce are unacceptable in our society?

MR. WEINGARTEN: We need to start saying so. I don't hear that very much. I don't hear it in Washington. I have heard some people say, "Well, we can't talk about that or we can't say those kinds of things now because they're not politically correct," but things become politically correct because people say that.

MR. MOSHER: Maybe we ought to start saying them.

MR. TAYLOR: Right. The spirit of the times, given the last 10 or 15 years in this country, is not real receptive to that. The whole thrust of regulation and politics has been against that flow that you just described. And you can't make it flow back upstream, but maybe you can start channeling it off to the side, at least, with recognition that there are both negative social values and positive social benefits from recognizing an alternative point of view to profit.

Distributional equity is not built into the system. Just because it's driven by profits, everybody doesn't get what they need, but we haven't thought about that in this country for 15 or 20 years, so I absolutely agree. That voice just has not been in the public debate.

MR. WEINGARTEN: Yes. And I'm not sure — I'm not ready to accept that it's not welcomed. I'd love to see ARL or some group of libraries do some intense public focus groups to find out what the average voter — the average person — thinks about their local library and their local school.

I'm not so sure that the people — this is a very pragmatic country — are that ideologically locked into one particular view. The ideology seems to pervade within the Beltway here, but I'm not sure there isn't a great deal of public receptiveness to arguments about the public need for information, for information services, for education, and so on.

MR. LUCKER: Jay Lucker, M.I.T.

I'd like to pick up on one of the comments Rick made, talking about the role of the libraries and how, retrospectively, we have to deal with all the print. The prospector has nothing to worry about. Everything is in electronic form.

I take exception to that as, first of all, being very Eurocentric, or North American-centric, and that it really doesn't look at a vast part of the world in which electronic access to information is totally non-existent; for example, Latin America and Africa.

Second, vast amounts of information that are of interest to us in this country are not in electronic form. One example is Japanese science and technology. Bibliographic information is accessible, but there are huge numbers of Japanese scientific and technical journals for which we have absolutely no access because they're not published electronically and they're not translated.

I think we have to worry, at least for the next decade or so, about providing access to information that's not in this wonderful electronic world.

You have all of the mathematicians doing mathematics online. Are the African mathematicians doing mathematics online? Do they have access to the online resources? Do Russian mathematicians? The power goes off, they not only don't have computers, they don't have light switches.

I'm a little worried, in thinking about this new world that we're in, that we assume we don't have to worry about information being stored, since it's all sitting here. I just don't think it's all sitting there.

MR. WEINGARTEN: Well, I was specifically addressing the issue of whether it would cost us the national budget to convert it, and I said no, I didn't think so, because a lot of it is already in electronic form.

The Japanese, in fact, are moving very fast towards digital printing. They were held back for a long time because of the need to convert their typography electronically, but they're moving quite fast. It's possible, pretty cheaply, to move from electronic to paper — a lot easier than moving from paper to electronic. For those who still want to use that, there's certainly a transition.

I was just specifically addressing the issue that we can't do it because it's going to cost too much.

MS. EISENBEIS: My name is Kathleen Eisenbeis. I've worked in ARL Libraries. I'm here today as a guest from the Universities Space Research Association. I'm a contractor now for NASA, hired to reach the research library community.

There is a new role, an information role, for government agencies, that many of them have never had. It's under the Information Infrastructure Task Force, and NASA is now making an attempt to reach out with the data — the earth science data, in particular — that has never been available to the research community and make it available. The research library community has an important role to play.

The one question that I've been given on my job is how to determine what role the research libraries have in disseminating this data. That's turning the table back around and puts you in the driver's seat.

NASA has never had this mission, never had this intent, as far as I know, except for the SDI information. I'm not talking about space data as much as earth science data.

I'm available to talk to you. My mailing address is USRA, 300 D Street, S.W., Suite 801, Washington, DC 20024. My e-mail address is keisenb@anamorphosis.usra.edu. I have an ftp site at USRA, where the discussion will be, and I've talked to Paul Evan Peters, and it will be on the ftp site at CNI.

I would like to impress you here with the idea that NASA needs to define its user community. An agency as big as NASA has no idea which users have ever used their data.

MS. MARTIN: Sue Martin, Georgetown.

I found myself this morning worrying my way through the first session on the role of government. Paul Peters has, in one way, hit part of my concern and, Rick did, too, especially with reminding us that change is constant. I like your saying that there is no NII.

That leads me to question how the government is approaching this and whether there is a role for us in that regard as well.

It seems to me that we have a situation where the government began this process several years ago, making certain assumptions about what its role is, about what users' roles are, and about what technologies are.

As we know, the government is a very slow-moving organism. My sense is that perhaps things have changed far beyond what the government is actually doing now, and what we're doing is sitting back, accepting it, and working with it. Perhaps we should be, with ARL as an organization or within other groups, stepping forward and questioning the basic assumptions and trying to — to the extent that it's possible with the government or any kind of large bureaucracy — move the conversation slightly either sideways or forward.

MR. WEINGARTEN: There really is no tradition in communications policy to taking users into account, but that's a very sweeping statement, and it's probably wrong. But I really believe that.

When I was at OTA, when we would do telecommunications policy studies, there was very little tradition, again, of asking users what they needed or of finding out how new applications would be woven into the new infrastructure. It was considered, in fact, a little heretical on our part that we would evaluate such a thing.

I think you're quite right that there are still a lot of barriers around town on that issue. I would really like to see the communities moving forward with their own positive visions and statements of what they want.

What one senior congressional staff member told me once about intellectual property law — which librarians are traditionally very active in worrying about — is that they're always reacting to what industry brings forward and says they want. Why don't they ever come forward with a bill and let the industry react to it? Why don't these communities come forward and say they want the system to do thus, thus, and thus, and use that as a starting point in the debate rather than kind of reacting sometimes when it's too late?

I think some of that's going on still in the NII communications policy discussion, that we're in the mode of reacting to what other people are proposing but don't really have a place at the table to set the agenda in the first place.

It's very tough. I'm not terribly optimistic, just based on what's happened over this last year. That's personal — that's not CRA's position — but I have been greatly disappointed over the last year in our ability to have public concerns and interests put forward into the framing of the NII policies.

I don't know why. I had thought going into this year that we're all on the same side.

MR. TAYLOR: You talk about the federal policy, but clearly the lead in that policy, at least in the Executive Branch, is Vice President Gore's own views of the NII, which have been continuously evolving and continue to evolve, I suspect, as we sit here.

They're pretty much making it up as they go along and responding to forces that impinge on them. You can be one of those forces, but there are an awful lot of them, and a lot of them have representation directly in Washington. Through your representatives — in your respective states, find your legislatures, your congressional representatives — go corner them back in their own districts.

If you have a university that they're concerned about or you can put together a coalition in their home district — people or groups that are concerned about this — work on them there.

You can also have, indirectly at least, some influence on the state level, as we heard about this morning, in North Carolina. If it starts popping up that these are concerns that are being addressed and significant things are happening in this area, then you're going to get some people's attention, but it takes a lot of action, a lot of work, and you're really working uphill at this point. It's tough.

MR. BILLINGS: Harold Billings from Texas.

I have the big question. Where are we going to advertise for cigarettes in the electronic information infrastructure? I say that with all seriousness, because if anybody thinks the publishing industry — the books, the journals, the magazines — that are being created, that are being bought by our society is really going to go away, get real.

There was some discussion this morning of the paperless society. I've got much more papered activity at work in my life than I ever had before I started tinkering with the microcomputers.

I think we really need some more doses of reality, and I think we had some this morning. I was particularly struck by some of the comments which said, "Don't be blinded by the hype," that libraries need to step up to the plate.

I would suggest that there has been a national information infrastructure in place for a long, long time. That infrastructure has been libraries. In more recent years, that infrastructure has been enhanced and extended by the Internet and by other networks.

What bothers me, I think, particularly in terms of looking at much of the discussion that's underway is the fact that it really seems to exclude libraries. If you look closely and if you'll listen closely to what we've been talking about today, libraries really are pretty much on the fringes. I suggest, for instance, that the information highway is not the message. It's just another medium, and it's just another medium in the kind of infrastructure, as I say, that we've had in place for many, many years.

I think that those of us that are involved in libraries ought to step up to the plate and say, "By golly, we're the main instrument for information dissemination in the world." We need to step up to the plate and do that.

I think our extrapolations are wrong at the present time, in looking at the projections of where we're going to be, given the fact that we're certainly going to continue the development of electronic information highways and the electronic products. Again, I would suggest that the libraries are a fundamental player in the infrastructure to come, just like we've been the principal player in the infrastructure in the past.

I think we have to recognize that our collections really still, and for a long time will, form the basic corpus from which learning and scholarship develop, evolve, and serve the basic teaching and research functions of our universities and society in general.

I think we as libraries really need to step up to the plate when we have this opportunity at the edge, as it were, of the NII development efforts.

MR. TAYLOR: At my own risk, I will comment on that in a neutral way.

I certainly would agree that your collections for a long time, indeed, will be at the core, and that is going to evolve over some time. But it brings to mind, also, the comment that Dean Neal made at the beginning when he questioned what is your role or, more in my terms, what business are you in.

By analogy, some years ago now, Robert Pepper, who was at the Office of Plans and Policy at the FCC, was asked, "What is the future of broadcasting?"

He said, "Well, it depends what you mean. If you're asking what is the future of people in the business of providing local information and entertainment services and being good programmers, the future is very bright; if you mean people who are in the business of owning big metal towers that emit non-ionizing radiation, I think they're in big trouble."

If your mind is that I'm in the library business, and my job is to run a big building that has lots of books in it, as opposed to what you said, I am running an institution for information dissemination, you are at risk of finding yourself in the same situation as the people with the big metal towers.

I think it really is up to you with how you define yourselves and what it is you do and how you're going to evolve with the situation.

MR. CURLEY: Arthur Curley, Boston Public Library.

I think it is important that we define who we are and what it is we think we're doing. I think, with Harold, that libraries are much larger than information. It's one of the components of our responsibilities.

I think we have all known that what libraries are about and what our profession is about is ideals. We seek to contribute to cultural and intellectual forces in our society.

I think Paul's comment this morning on the extent to which the research and education community built the Internet is something we must not overlook, and I think we must not be ashamed of what we are.

There are several realities we confront. I happen to think the future is full of bright, optimistic possibilities for libraries.

I think it's because we are going to continue to be who we are, we're going to adapt. Because we've lived through about two decades in which our society has valued our libraries less than it has in the past, we've been under a lot of pressure to conclude that there's something wrong with libraries. I suggest there isn't.

In fact, even a big building full of lots of books happens to be something that an awful lot of people think is a pretty nice thing. We've put up a lot of money to support it.

If we thought that's all we were about I think we'd be missing the point. But I don't think we need to give up the things that we are, that people value, respect, and use, because it is necessary in this age to move toward adaptation to technological changes.

It may very well be that we do not have the dollars and the muscle to influence national policy, but it's sheer suicide and irresponsibility for us not to make the effort.

I think that the statement "Renewing the Commitment to a Public Interest Telecommunications Policy" is one of the finest statements — from the prospective that we represent — that I've seen in some time. It's been subscribed to by the Association of Research Libraries, the American Library Association, and some of our natural allies in what is truly a battle for the values. Please pick it up and subscribe to it.

[Note: See Appendix II, page 87.]

MR. NEAL: Any comments.

MR. FRAZIER: I'll bite on the challenge.

This is Ken Frazier from the University of Wisconsin-Madison.

I think we're in the business of acquiring, organizing, and supplying scholarly and research knowledge. The fact is, though, that some of this scholarly and research knowledge has a very limited market, and that's going to continue to be the reality.

I don't sense despair or any lack of optimism at all, but it is a great irony, I think, that, at the end of the Cold War, we're approaching a time where we've made the world safe for nationalism, racism, and economic determinism. Maybe that last point, most certainly of all.

My question is: what is the place in this converged marketplace of telecommunications, media, publishing, and computing? What is the place for cultural knowledge that has little or no value in today's marketplace?

MR. TAYLOR: That's a good question.

But it goes not only for libraries but for higher education. I mean, there are people with specialties who teach in our universities that if the market were supporting them, would probably have a hard time.

That, I think, has to be made in the context of the case for what is the value of scholarly research that is not immediately applicable, because that is something that is being challenged, and the tide is again flowing against that. Universities tend, at some level, to follow the federal funding, and now the thrust is how can you convert products into the marketplace in three years, or something like that. This goes completely against supporting esoteric bits of knowledge or fields of study, and that's part of the case you've got to make of what that value is and its tradition history.

MR. WEINGARTEN: This is especially true in areas where there's no federal funding. It seems to me that one of the real problems that research libraries face is the fact that some of their clients are very well supported by the government as researchers; in other areas of research, there's no government interest whatsoever, or very little.

Even within traditional fields of hard science, one finds a smaller and smaller fraction of the scientific community being supported by the federal government.

So one of the very concrete policy issues that we had to wrestle with this year is attempts by the phone companies to move the funding for the Internet down to the individual user level and say, well, if they have funds for it, they can pay for it.

They don't understand or care that, while maybe a third of the community of scholars on campus will, in fact, have federal funds with which to pay for Internet access and access to information resources online, the rest of them won't.

It seems to me that universities and research libraries are going to have to really draw a very hard line here and say that they support the scholarly community, period, and they're going to have to find ways to pay for the Internet, or pay for whatever the network of the future looks like for scholars, and pay for it in such a way that supports the scholarly and education community, not just those who happen to be lucky enough to get a few bucks from NSF.

The large concerns that are very deep and very important are being collapsed into very specific policy debates at NSF and in Congress.

MS. CLINE: This is not so much a question as a comment, reflecting on the question I asked earlier.

I think one of the things that strikes me about our day today is we've learned an awful lot more about what's out there and how we might want to position ourselves in regard to the constituencies with which we work and with which we compete.

The most important thing is going to be working beyond our community. It's not going to do us any good to applaud ourselves in such a room as this or to walk out of here and feel that we're renewed in our optimism about our place in society and the value that we bring to society if we cannot affirm it in these other contexts.

What Rick just said about things being boiled down to very specific policy issues and very specific determinations within other areas would pose one of the greatest threats if we are not working constructively to reinforce in so many other people's understandings how research works and how education depends upon open and unfettered access to information. It's not enough to view a video once — whether it's educational or entertaining — but to be able to go back to it and to consult it again and again without having to pay by the drink, without having to worry about whether we determine this scholar is worthy or this scholar is not worthy of having access to some of the various systems that we're setting up.

I think we really must take a very proactive stance and be prepared to work with a lot of new players, and maybe there are people that we don't particularly like, but I think we have a real responsibility to be out there and communicate.

MR. NEAL: What I have learned over the course of the day is that public interest is very much part of the library imperative. Scholarly interest is very much part of the research library imperative.

As Nancy has just indicated, our challenge is to keep this issue, this imperative, as part of the national information infrastructure debate.

Help me in thanking Rick, Richard, for provoking our thinking today.

(Applause.)

APPENDICES

APPENDIX I

BACKGROUND NOTES

Prudence S. Adler
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September 1993

The information landscape has been characterized as one of constant change. Multiple efforts, programs, and initiatives, both public and private, are moving us closer to communicating via a highly integrated, interactive network that utilizes voice, data, image, or video. But because this landscape is changing at such a rapid pace due to technological and political activities, it is difficult to form a complete view or picture of this infrastructure.

Research libraries intersect all points of the emerging information infrastructure equation — thus it is critical that policies and programs proposed and implemented regarding the information infrastructure reflect the needs and interests of the research and education communities.

These background notes briefly describe selected programs, legislation, initiatives, and stakeholders that are influencing the evolution of the information infrastructure. It is by no means complete (for example, state-based or regional programs are not included) but instead highlights "pieces" of the emerging infrastructure. It is designed to be a glossary of sorts and provide some context for the strategic planning discussions at the fall ARL meeting on the emerging information infrastructure.

Canadian and U.S. Programs

Canadian Programs

CANARIE: Industry and Science Canada recently announced a program to invest $26 million in phase one of the Canadian Network for the Advancement of Research, Industry, and Education or CANARIE. CANARIE will be operated and managed by the private sector. Private sector contributions to phase I will be $89 million. Similar to its U.S. counterpart (NREN), it shares related goals of linking users with a vast array of information resources, electronic mail, and "digital libraries" at minimal cost. Key network applications include those related to health care, astronomy, agriculture, fisheries, and forestry.

There are four components to phase 1:

1) upgrade CA*Net to meet increased traffic and demand for higher bandwidth;
2) establish test networks and laboratories in the private sector for purposes of experimentation with new technologies and applications;
3) develop advanced technologies and products including software and services to meet the needs of the emerging telecommunications infrastructure;
4) prepare a technical feasibility plan including financial requirements of phase II and phase III.

Follow-on phases call for the additional investment ($450 million) to stimulate new networked-based services and applications (1995-98) and eventually offer these services via operational networks (1998-2000) at an estimated cost of $600 million.

U.S. Programs

On September 15, 1993, the Clinton Administration announced *The National Information Infrastructure: Agenda For Action, ("NII")*. This agenda follows the February 22, 1993 Clinton-Gore Technology Initiative, "Technology for America's Economic Growth, A New Direction to Build Economic Strength." The *"NII"* agenda is a series of proposals that will advance the development of the National Information Infrastructure, "a seamless web of communications networks, computers, databases, and consumer electronics that will ... change forever how people live, work, and interact with each other." (*"NII"*" page 3) The Administration's program is ambitious and far reaching. The *"NII"* agenda assumes that government actions will "complement and enhance the efforts of the private sector." Key principles and objectives seek to:

- promote private sector investment through appropriate tax and regulatory policies;
- extend the "universal service" concept to ensure that information resources are available to all at affordable prices;
- act as a catalyst to promote technological innovation and new applications;
- promote seamless, interactive, user-driven operation of the NII;
- ensure information security and network reliability;
- improve management of the radio frequency spectrum;
- protect intellectual property rights;
- coordinate with other levels of government and with other nations;
- provide access to government information and improve government procurement.

To develop programs to achieve these goals and objectives, the Administration has formed an Information Infrastructure Task Force, (IITF). It will be comprised of high-level federal officials that "play a major role in the development and application of information technologies." There are three committees of the IITF: Telecommunications Policy, Information Policy, and Applications and several working groups within the Committees.

> *Telecommunications Policy* will formulate consistent Administration positions on key telecommunications issues. The Working Group on Universal Service "will work to ensure that all Americans have access to and can enjoy the benefits of the NII." (*"NII,"* p.19)
>
> *Information Policies* will address information policy issues requiring consideration if the NII is to be "fully deployed and utilized." (*"NII,"* p.19) Three working groups will focus on issues relating to Intellectual Property Rights, Privacy, and Government Information.
>
> *Applications* will coordinate Administration efforts to develop, demonstrate, and promote applications of information technology in manufacturing, health care, government services, libraries, and other areas. A Working Group on Government Information Technology Services will coordinate efforts to improve applications of information technology by federal agencies.

The Administration will also appoint 25 non-governmental representatives to the U.S. Advisory Council on the National Information Infrastructure. The Council will include representatives from the "business, labor, academic, public interest groups, and state and local governments." ARL has been asked to nominate three individuals for consideration to this Council.

Network Origin and Status: The Administration's agenda builds on a long-standing Federal investment in building, designing, and supporting networks and network research. For example, Internet's technology evolved from Arpanet, a project initiated in 1969 that demonstrated packet-switching. And the National Research and Education Network or NREN program, results from the investments in NSFNET. NSFNET was initiated in 1986 with the related goals of connecting five geographically dispersed supercomputer centers and users, and of fostering communication, research, and collaboration in scientific and research endeavors. Today, NSFNET interconnects 16 nodes throughout the U.S. with a mid-level tier of 20 plus regional networks that in turn provide network access to institutions, schools, libraries, industrial organizations, and commercial entities.

In May, NSF released a solicitation that seeks to address the need for continued development of the NSFNET to achieve many of the goals of the High-Performance Computing Act of 1991. The High-Performance Computing Act of 1991 provides a framework to advance U.S. interests in high-performance computing, networking, and telecommunications technologies and established the NREN. The Act specifically calls for the development of a gigabit speed network by 1996 if technically possible.

The solicitation is seen as both a means to extend current network capabilities and capacities as well as test new innovations needed for the gigabit NREN. The solicitation: 1) allows for much higher bandwidth and will result in a variety of service providers, both profit and not-for-profit and 2) encourages a network architecture that will allow greater flexibility for growth and for development of different kinds of services.

The solicitation represents a shift in federal policy as illustrated by the following statement. "NSFNET will: develop increasingly high performance network services, accommodate the anticipated growth in numbers of users and networks and in network traffic; *and transition to a networking infrastructure that is increasingly provided by interconnected network service providers operating in a competitive environment.*" (NSF Program Solicitation, May 6, 1993)

Related programs: There are many programs that will push networked-based activities forward in the next year. Two listed below are illustrative. These will generate new research and development to support the creation of digital libraries, will spark r&d on digital libraries via an interagency program, and have implications well beyond the U.S. Most importantly, both initiatives could provide needed financial support and federal guidance to make digital libraries a reality. A third program seeks to connect new communities and users to Internet. This latter program is key piece of the Administration's agenda.

NSF Digital Library Initiative: NSF's Computer and Information Science and Engineering Directorate with ARPA and NASA just announced a digital libraries initiative. The Digital Library Initiative seeks to "explore the full benefits of digital libraries," and to "achieve an economically feasible capability to digitize massive corpora of extant and new information from heterogeneous and distributed sources.; then store, search, process, and retrieve information from them in a user friendly way." The following research could be supported through this project:

1) capturing data (and descriptive information about such data) of all forms (text, images, sound, speech, etc.) and categorizing and organizing electronic information in a variety of formats;
2) advanced software and algorithms for browsing, searching, filtering, abstracting, summarizing and combining large volumes of data, imagery, and all kinds of information; and
3) the utilization of networked databases distributed around the nation and around the world.

NASA's EOSDIS or the Earth Observing System Data and Information System. This program is part of the U.S. Global Change Research Program, established by Congress to observe, understand and predict global change. Data and information required to conduct this environmental research, and the results, are to be made available, in useful form, to policymakers, scientists and the public. The national information system for global change as envisioned by the National Academy of Sciences, is an aggregate, a "virtual library," to be built upon existing systems. NASA is interested in exploring the role of research libraries in this program.

Within NASA, the Earth Observing System (EOS), a series of satellites for long-term global observations of the land surface, biosphere, atmosphere and oceans, is the centerpiece of the multi-agency, government-wide, coordinated initiative known as Mission to Planet Earth. A major component of the EOS program is the development of a comprehensive data and information system (EOSDIS) to make Earth science data and information easily available to a wide variety of users. EOSDIS provides a wide variety of functions, including the management, distribution and archiving of the data resulting from NASA's Earth science research programs. The data and information system of EOSDIS is physically distributed and will be networked to external users by means of the Internet and the NREN as it develops.

The role of research libraries in the EOSDIS is a major concern for NASA: What role are they willing and able to play in the current and future development and use of the system? The first working version of EOSDIS (Version 0), which interconnects the existing Earth science data systems, has been developed and is being tested. Version 1 is to be implemented during the 1995-97 time frame and should provide integrated access to the data and information system to the public. What is currently accessible on Internet through the National Space Science Data Center, NASA Goddard, is the Master Directory data information service. The Master Directory describes data sets, data centers, projects, spacecraft, and sensors. (EOSIS briefing prepared by Kathleen Eisenbeis, USRA)

National Telecommunications and Information Administration — NTIA. The Administration has requested funds and there is proposed authorizing legislation for a program for networking pilot projects. This program will provide matching funds to state and local governments, health care providers, school districts, libraries, universities, and other non-profit entities to connect institutions to networks. Through this program the Administration hopes to "connect" new constituencies and users to networks, with a focus on schools and libraries. This program is a key element of the Administration's *"NII."*

Selected Congressional Initiatives

There are numerous proposals that approach information infrastructure issues from a scientific and research perspective and from a regulatory perspective.

Follow-on legislation to the High-Performance Computing Act of 1991, H.R. 1757, the National Information Infrastructure Act of 1993, recently passed the House of Representatives. Title VI of S. 4, the National Competitiveness Act of 1993, contains many of the same provisions as H.R. 1757.

H.R. 1757 amends the High-Performance Computing Act of 1991 and calls for the establishment of an interagency program to implement the broad-based view of the NREN via applications in four key areas: government information dissemination, libraries, health care, and education. Other program components include network access and research in support of applications. In the former, the National Science Foundation would assist educational institutions, including libraries establish local networks and gain connection to the Internet. In the latter, a plan would be developed that delineates specific research activities to address issues such as network security and privacy and the R&D required to develop and demonstrate user-friendly network interfaces. It is important to note that no new funds are authorized to promote these new applications.

Several telecommunications bills have been introduced that address telecommunications issues from the perspective of a regulated environment. HR 1504 would lift the provision in the 1984 Cable Act which bans telephone companies from providing cable TV services in local telephone service regions. The bill would permit the telcos to provide video dialtone services. The second bill, HR 1312, the Local Exchange Infrastructure Modernization Act and its companion bill in the Senate, S. 570 would allow for small independent phone companies to share facilities, resources, and services with larger phone companies and share technologies in provision of local exchange services. These activities would be permitted in support of modernizing the network.

S. 1086, the Telecommunications Infrastructure Act of 1993 seeks to spark the development of advanced telecommunications services though implementing significant regulatory and legislative changes vis-a-vis the provision of phone and cable services.

Stakeholders And Their Visions

The information infrastructure initiatives have resulted in a plethora of vision statements by many affected communities. Each community has developed "their" vision of the information infrastructure. Vision statements from the Computer Systems Policy Project (an affiliation of CEO's of computer companies), the National Association of Manufacturers, the Information Industry Association, the Association for Local Telecommunications Services, the Council on Competitiveness, the telecommunications industry (the RBOCs), the Center for Civic Networking, Computer Professionals for Social Responsibility, and the Telecommunications Policy Roundtable, represent key statements developed to date. (*)

There are common themes in many of the statements; e.g., most of the vision statements acknowledge that provision of services will be global and fundamentally different in the years ahead. For example, the vision of the Council on Competitiveness states,

> "The information infrastructure of the 21st century will enable all Americans to access information and communicate with each other easily, reliably, securely and cost-effectively in any medium — voice, data, image or video — anytime, anywhere. This capability will enhance the productivity of work and lead to dramatic improvements in social services, education, and entertainment."

Another common theme, and one that is reflected in CANARIE and the Clinton Administration's *"NII"* is the recognition that the commercial sector will have a dominant role in the "building" of the infrastructure via investments in the facilities, fiber, cable, and that these investments are the driving force behind the development of the infrastructure. This has been and continues to be an area of tension as players seek to define "appropriate" and needed public/private roles. It is also an arena where the stakes may be the highest for research libraries and other non-profit organizations as these communities are not seen as building the infrastructure nor driving the market.

Where many of the visions differ is in who will be providers of what kinds of services as they are defined and regulated today.

Until recently, most of the statements were generated by the commercial sector. Three recent statements by the Center for Civic Networking, the Center for Media Education, and a forthcoming statement of principles by the Telecommunications Policy Roundtable make a strong and persuasive case for the need to consider the public good or public interest needs in designing, developing, and implementing the information infrastructure.

Beyond the vision statements and while governments and legislatures are developing new agendas and setting public policy, new strategic alliances are being formed on national and global scales. Cable, telephone, utilities, and the entertainment industries, are beginning to grapple with and define new roles and relationships in this rapidly changing telecommunications landscape. New partnerships are forming that will radically change who provides what services and at what cost. It will be increasingly difficult to design programs and laws that can keep pace with the new services and relationships that are under development.

A recent article in the *New York Times*, "While the Cable and Phone Companies Fight ... Look Who's Wiring the Home Now" (*NYT Magazine* , 9/26/1993, p. 46) demonstrates why it is so difficult to keep up with current investments and the activities of stakeholders. In a pilot project, Entergy, a New Orleans-based power company connected 50 homes and their electric service to a computer and telecommunications network. The goal of the Project is to save energy and money. The author notes, "Powerful home computers, linked by fiber-optic cable, will enable consumers and utilities to work together for the first time to accomplish these savings. Enough will be saved in unnecessary generating plants and in monthly utility bills to make the fiber-optic cable practical. And that means that avenues for dozens or hundreds of additional channels will have been created virtually free." Entergy intends to extend the project to 440,000 additional homes because the results were so beneficial.

Other questions have been raised concerning the benefits to consumers from these new alliances. For example, Schrage of the Los Angeles Times states, "The fundamental question here is whether market forces will create more and better choices for consumers or whether these industry covergences will do little but establish a multimedia oligopoly that requires precisely the sort of re-regulation that the cable companies managed to bungle themselves into last year." (*Washington Post*, 5/21/93.)

* The Canadian Library Association is in the process of developing a statement of principles.

APPENDIX II

A PUBLIC INTEREST VISION FOR THE NII: PRINCIPLES

In an effort to ensure a public voice in the emerging national information infrastructure (NII), the Association of Research Libraries, along with more than 60 other nonprofit organizations, recently came together to establish a Telecommunications Policy Roundtable. This group was launched to encourage the nonprofit community to participate more fully in the many critical information infrastructure and telecommunications policy debates underway. Recognizing that the benefits of the information infrastructure are more than economic or functional and should reflect the values of a democratic society, the Roundtable drafted a set of principles that are a renewal of the commitment to a public interest in telecommunications policy. ARL played a key role in the formulation of the Roundtable and endorsed the following seven principles "to guide policy making in order to ensure that future generations inherit an information infrastructure that enhances the quality of life for everyone."

Public Interest Principles

1. *Universal Access*

All people should have affordable access to the information infrastructure.

Fundamental to life, liberty, and the pursuit of happiness in the Information Age is access to video, audio, and data networks that provide a broad range of news, public affairs, education, health, and government information and services. Such services should be provided in a user-friendly format, widely available to everyone, including persons with disabilities. Information that is essential in order to fully participate in a democratic society should be provided free.

2. *Freedom to Communicate*

The information infrastructure should enable all people to effectively exercise their fundamental right to communicate.

Freedom of speech should be protected and fostered by the new information infrastructure, guaranteeing the right of every person to communicate easily, affordably, and effectively. The design of the infrastructure should facilitate two-way, audio and video communication from anyone to any individual, group, or network. The rights of creators must be protected, while accommodating the needs of users and libraries. Telecommunication carriers should not be permitted to constrain the free flow of information protected by the First Amendment.

3. *Vital Civic Sector*

The information infrastructure must have a vital civic sector at its core.

For our democracy to flourish in the 21st Century, there must be a vital civic sector which enables the meaningful participation of all segments of our pluralistic society. Just as we have established public libraries and public highways, we must create public arenas or "electronic commons" in the media landscape. This will require the active involvement of a broad range of civic institutions — schools, universities, libraries, not-for-profit groups, and governmental organizations. It will also require vibrant public telecommunications networks at the national, regional, and state level.

4. *Diverse and Competitive Marketplace*

The information infrastructure should ensure competition among ideas and information providers.

The information infrastructure must be designed to foster a healthy marketplace of ideas, where a full range of viewpoints is expressed and robust debate is stimulated. Individuals, nonprofits, and for-profit information providers need ready access to this marketplace if it is to thrive. To ensure competition among information providers, policies should be developed to lower barriers to entry (particularly for small and independent services); telecommunications carriers should not be permitted to control programming; and antitrust policies should be vigorously enforced to prevent market dominance by vertically-integrated media monopolies.

5. *Equitable Workplace*

New technologies should be used to enhance the quality of work and to promote equity in the workplace.

Because the information infrastructure will transform the content and conduct of work, policies should be developed to ensure that electronic technologies are utilized to improve the work environment rather than dehumanize it. Workers should share the benefits of the increased productivity that those technologies make possible. The rights and protections that workers now enjoy should be preserved and enhanced. To encourage nondiscriminatory practices throughout the information marketplace, public policy should promote greater representation of women, people of color, and persons with disabilities at all levels of management.

6. *Privacy*

Privacy should be carefully protected and extended.

A comprehensive set of policies should be developed to ensure that the privacy of all people is adequately protected. The collection of personal data should be strictly limited to the minimum necessary to provide specific services. Sharing data collected from individuals should only be permitted with their informed consent, freely given without coercion. Individuals should have the right to inspect and correct data files about them. Innovative billing practices should be developed that increase individual privacy.

7. *Democratic Policymaking*

The public should be fully involved in policy making for the information infrastructure. The public must be fully involved in all stages of the development and ongoing regulation of the information infrastructure. The issues are not narrow technical matters which will only affect us as consumers; they are fundamental questions that will have profound effects on us as citizens and could reshape our democracy. Extensive efforts should be made to fully inform the public about what is at stake, and to encourage broad discussion and debate. The policy process should be conducted in an open manner with full press scrutiny. Effective mechanisms should be established to ensure continued public participation in telecommunications policymaking.

At the end of October 1993, more than 60 organizations had endorsed these public interest principles. In addition to ARL, ALA, and other major library associations, endorsers include:

- *Alliance for Community Media*
- *Alliance for Public Technology*
- *American Council of the Blind*
- *Center for Policy Alternatives*
- *Computer Professionals for Social Responsibility*
- *National Coalition on Black Voter Participation*

For a complete list of endorsers, contact Emily Littleton at the Center for Media Education at 202/628-2620, cme@access.digex.net.

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APPENDIX III

NREN AND THE NATIONAL INFRASTRUCTURE: POLICY DECISIONS FOR LIBRARIES

by
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Introduction

In less than a decade, the Internet has become a worldwide resource — an indispensable tool for the research and education community. Now, spurred by the success of the Internet, a new political vision — creating a new National Information Infrastructure (NII) — has begun to dominate the communications policy debate. The NII was a major element of the Clinton/Gore campaign platform, and the new administration is actively promoting the vision. It was a core element, although developed in only very general terms, of the administration's Technology Plan released in February of this year, and a White House Interagency Task Force is busily working to put flesh on the concept. Congress is considering several bills directed at creating an NII.

The computer and information industries, the telecommunication industry, and many public interest groups have all endorsed the need for such a national program, although their views of what the NII should look like diverge widely.

It seems clear that technological, political, and economic forces are combining to energize the creation of the NII, and that it will materialize in some form or other. Over the next few years, basic decisions in government and in the private sector will be made that will determine the fundamental characteristics of the NII. Users, particularly organizations such as libraries that are intensive users of information, need to formulate their own visions and participate actively in shaping the NII.

To do so will be a difficult endeavor. Although a few public interest and consumer groups have long been active in communications policy, this is in general an uncharacteristic role for most users. Furthermore, it has not been common to take user needs into consideration in making communication policy, again beyond a certain broad, common denominator level of concern over rates.

Technical Characteristics of the NII

Both the capability and the demand for a new NII are the product of technological change in both computers and communications. Advances in microelectronics and fiber optics have been major drivers, of course. But, so also have been other technical advances in areas such as software engineering, data structures, visualization, and computer architecture served to open up new possibilities, particularly for applications. Whatever their differences among themselves over details of their visions, most stakeholders agree that an NII would have the following technological characteristics:

- **Speed.** NII transmission speeds will be substantially faster than the current telephone network, although it is not yet clear how fast it will be — hundreds of thousands, millions, or billions of bits per second. Technological capabilities are improving rapidly, as are the demands for speed.
- **Integration of Computer and Communications.** Computer and communication technologies are being woven together inextricably. Distributed computing applications are placing increasing demands on the capacity of the

communications system, and computing is being imbedded in the network. In some cases, so tightly are they coupled that to computer scientists, when several computers are linked together with a very high speed network, that collection, itself, is beginning to resemble a single distributed, parallel computer.

- **Digital Formats.** Information in digital (as opposed to analog) format not only is transmitted more reliably and quickly, but it is in a form directly usable by computers. That means that, not only can the information be stored, manipulated, and displayed in many ways, it can be recognized and interpreted within the transmission system, which is, itself, computer controlled.
- **Portability.** Although it will probably not replace wire or fiber as the dominant two-way communication link to the home or office, digital radio is already beginning to free users from depending on wires, and that trend will continue. AT&T is promising "personal phone numbers" with connectivity anywhere, any time. Some lap top computers already come equipped with cellular modems. Some computer manufacturers refer to "nomadic" computing as the future pattern.
- **Multimedia.** In digital encoding, all forms of information, sound, computer data, images, or text "look alike" to the system at some basic level, allowing them all to be handled in the same way and by the NII for storage, transmission, or processing.
- **Multiple uses.** The NII will carry a wide variety of applications and services, in contrast with the current telephone, broadcast, or cable television systems, each of which was created to provide a very narrow range of services.
- **Flexibility.** Much of the capability of the new NII will reside in its computer software and data bases, rather than in the fixed hardware. Hence, the system will far more flexible and able to support a wide variety of services, some of which may not even yet be imagined.

The Need for a User Perspective

Beneath this list of general technical characteristics, however, lies a host of difficult, still unanswered questions, many of them raised or complicated by the very flexibility that makes NII so attractive. For instance:

- **Exactly what technical capabilities should the NII have?** The list of capabilities above leaves much to be decided. Exactly how fast should the network be, particularly in the so-called "last mile," the lines that connect to the user in his or her home or office. How heterogeneous? On which transmission standards and network architecture should it be based? The answers to these questions will determine the range of services and resources that will be available over the NII.
- **How much will (or should) should the NII cost?** A key tradeoff with technical sophistication is cost. How much do we as a society want to invest in a new infrastructure? Some advocates are proposing a very low-cost ISDN system using most of the current copper infrastructure now in place. At the other extreme, estimates for an extremely high-capacity system based on optical fiber to the home run as high as $400 billion.
- **Who should pay for the NII?** Who will ultimately pick up this bill? Barring the unlikely event that government finds extra money lying around, the private sector will make the investment. Traditionally with telephony, that investment has been passed along to all consumers in their telephone bill with some adjustments being made to keep the cost of basic service low. In the first place, everyone was considered to benefit from improvement in the service.

  Secondly, telephone service was the principal source of revenue for the phone companies; they had nowhere else to turn for income. The policy arguments came within that rather narrow framework of rates — that is, to what degree should long-distance rates be set higher and used to subsidize local rates. To what degree should rates for business users be set higher and subsidize basic level service for the home? (An important point here is that we have a precedent for differential pricing and using higher-priced services to subsidize certain other services. This particular system of cross-subsidizing could not be sustained for a variety of reasons in recent years, one of the major motivations for deregulation.)

What is the appropriate reasoning in this new NII? Will everyone find it equally beneficial? If the sale of information services provides the largest revenue stream, as many expect, should those service providers pay for the infrastructure? Should the physical carriers be allowed to offer higher level services as an incentive for them to invest in the network? This issue leads to the next cluster of questions.

- **Who should run the NII and what spectrum of services should the physical network operators be allowed to offer?** Some of the fiercest battles are now underway over this set of issues. Organizations are competing with one another for the rights to install and operate the infrastructure. Part of that fight is over the question of how broad a range of services they will be allowed to provide. Traditions in telephony and broadcast differ sharply on this point. Complicating the picture even more is the recent wave of mergers among previous competitors, telephone and cable, long distance and cellular telephony, information providers and distributors. These mergers, as well as decisions in the courts allowing or barring line-of-business restrictions, may remove some roadblocks and create larger pools of investment capital, but they may also preclude policy choices.
- **Who should be able to use the NII?** Access to the infrastructure is a many-faceted issue. Many potential barriers to access exist, from physical limitations, to high cost, and the ability to use modern information technology. Some of these issues are analogous to questions that have arisen in the cases of telephony or broadcast; some are new.

  For instance, telephone conversations are inherently two-way, symmetric in terms of speaking and listening. In that case, access means the ability to participate, equally to speak and to listen. Broadcast and cable, on the other hand, have been asymmetric. The ability to view is not the same as the ability to transmit. In the world of cable, "public access channels" represent a limited attempt to provide some rights of the public to transmit. But that is a very limited right, and access is still very uneven in the mass media. (Interestingly, VCR has, in contrast, been a democratizing technology, lowering the entry cost and complexity of producing programs.)

  The NII offers a new world of services. Some are still two-way communications; some are still one-way mass media services. Some, like bulletin boards, exhibit a completely different character. Defining what is meant by access will be a major and difficult issue of key importance to users. Traditional service providers may be inclined to apply their model to all services they provide.
- **What should be the role of Federal and local governments?** Of course, for many years, that question was answered simply. A private monopoly provides the service, government at both levels regulates — EVERYTHING. Over the last decade, we have steadily deregulated telecommunications. In part this was in recognition of the technological reality that monopolistic and rigid government control of the system at all points was not possible and to make the attempt would simply warp and inhibit the modernization of our infrastructure. Of course, deregulation also happened to be compatible with the acknowledged

> political and ideological tenor of the last two decades. That is not to say that the issue has been resolved completely. State and local governments, as well as the courts, retain many controls over the communications system. Some of those residual controls may, indeed, constitute barriers to the evolution of the system. Clearly, government policy must be in response to public interest. If communications were, in the words of a past FCC chairman, the market equivalent to a toaster, there is no justification for much regulation other than consumer safety. Arguments for government intervention, then, must be accompanied by clear statements of the PUBLIC PURPOSE to be accomplished by that intervention.

All of these questions might be called "Infrastructure Policy" questions, since they concern the construction and operation of the basic NII communications system. "Information policy," on the other hand, is the term used for issues that concern the "stuff" of the infrastructure, the information and services that flow over the conduit. This distinction is becoming increasingly difficult to keep. Just as computers and communications technology are merging, so the concepts of conduit and content are becoming increasingly difficult to keep separate. This merging creates new difficulties for telecommunication policy makers, since they have traditionally treated those two domains as distinct.

Most particularly, that distinction has been used to keep users out of the communications policy debate (or, at least, bound their participation), by arguing that communications policy simply involves "technology" decisions. In the current communication system, particularly telephony, content is simply not a major domain of policy and the conduits are the switched telephone network. User interests rarely go beyond rates (to be low), ubiquity (to be universal), and quality (to be understandable).

The NII, on the other hand, is envisioned as combining several traditional services (telephony and cable television, for instance) and, additionally, supporting a vast array of new information services, many yet to be imagined. Although policies on broadcast, cable, or telephony could be narrowly focused on delivery of those specific services, the domain of policy on the NII will be exceptionally broad. The NII will support a wide variety of uses and communities of users. Technological choices, then, since they will strongly affect who can use the system and for what, cannot be made with the same detachment from information policy, and from users.

Some policy makers assert that infrastructure design is simply "technology" and, therefore, the proper domain of engineers and industry. They promise that "policy," referring to information policy, will come later. As can be seen above, this argument simply ignores the deep implications technological choices can have on critical public interests. Furthermore, it assures that powerful economic interests are sitting at the table before the public interest is admitted to the room.

Another important, perhaps pivotal point is that the definition of an infrastructure commonly includes the organizations, social structures, and services that are integral to its useful operation. In the past, that broader definition has been unimportant to telecommunications policy. The service, telephony, was inseparably linked to the wires and switches that were the medium, and the provider of the medium also provided the service. There is no other case of such large corporations dealing directly with their end-user customers, no matter how small, without intermediaries such as retail stores, agents, and the like. (This history may be distorting the communication companies' views of the information marketplace and their role in it. That market structure is likely to be far more diverse and multi-layered, as it is already in the case of the print industry.)

Libraries are organizational constituents, along with schools and research laboratories. As public information institutions, they, in some sense, need to participate in the policy debate both as users of the NII, but also as organizational parts of it, as providers of services.

Contrasting Views of the NII

Much of this confusion over policy seems to stem from different views of the nature of the National Research and Education Network (NREN) and its relationship with the NII. The NREN is variously seen as:

- A platform for research and development in ultra high-speed communications systems and applications of them.
- A playground for a technological elite, for hackers and companion explorers of a new "electronic frontier."
- An interim system, intended to serve some parts of the education and research community until a fully capable NII is offered by the communication and information industry.

The existing Internet has exhibited all of those characteristics at some time or other. But, these characterizations distract the debate from a bigger and more important issue. We need to focus on the question of how to maximize public benefits from the new information infrastructure, whatever form it may finally take. To provide such benefits, we need to develop a clear, consistent and conceptual vision of what an NREN is and is not, and how it would be organized, funded and managed.

The Multi-Faceted Structure of NII

The infrastructure, as it has evolved conceptually over the last few years in the political debate, can be thought of as composed of three different network systems, interconnected and serving somewhat overlapping constituencies. Figure 1 illustrates the network as a set of three layers. The vertical dimension roughly represents technological sophistication, and the horizontal metric represents the size of the intended base of users, although, as the figure suggests, some overlap exists.

The "High Technology" Research Segment

The top layer is a collection of specialized, ultra-high-speed data communication systems, the most advanced state of the art communications technology. These systems are the true multi-gigabit networks. They are in large part experimental and serve academic and industrial researchers by providing leading-edge services-interconnecting supercomputer centers; carrying data from large, data-intensive research instruments; or connecting researchers in geographically distributed projects.

Technologically, these networks are, for the most part, custom designed and built. They push the state of the art far beyond what is commercially available; and, in many cases, they serve as test-beds for possible future commercial service offerings.

The "Pure NREN"

This segment of the infrastructure provides a wide range of digital data communication services not only to scientific researchers and educators, but also to students and scholars in all fields. Users would access the network principally through its client institutions-colleges and schools at all levels, libraries, museums, and industrial research laboratories. Networks would offer access to a variety of educational and public information services and resources, formal and informal education, virtual museums, public health services, and access to a variety of government social services and databases.

These networks would provide specialized public information services over high-speed commercially-contracted communication lines. Although the pure NREN would be accessible from the switched telephone network, services that depended on the higher data rates and specialized services offered by the network would not necessarily be available, or they would be accessible only in limited form through that interface.

The Universal Infrastructure

The universal infrastructure will extend digital data communications to every home and office-even, if technological trends continue, to every coat pocket. The technological parameters of this network, or set of networks, are difficult to predict at this time; however, the network would no doubt replace the existing telephone system. Depending on its capacity and speed (as well as regulatory decisions), it could also incorporate a large proportion of the existing cable and broadcast infrastructure. Thus, the political battle over who will build the network and who will provide services over it has become extraordinarily intense.

The universal network would reflect a compromise between the desire to make a national infrastructure as sophisticated and long-lasting as possible, and the need to make it broadly affordable and accessible to all people. The need for such a compromise will likely result in a national network of universal, but limited capabilities, coupled with an assortment of more sophisticated services to which access will be limited by price, by geographic location, or by other characteristics.

The Nature of the NREN

A Public Interest Network. The second layer, the NREN (or whatever it may be called), might be thought of as the public interest segment of the future information infrastructure. It will serve certain universal service needs that are not met by simple physical access to the network fiber.

In the traditional phone system, universal service has been relatively easy to provide for. Two characteristics of the system, low cost and physical access to the network, were key. Attachment to the network at a reasonable price meant access to the service-switched voice telephony to everyone else on the network. The service and the network were, in essence, the same.

In the case of the NII, the picture will not be nearly as simple. To assure low-cost, physical connection to the network should remain an achievable technical and economic goal. But, access to the physical infrastructure will in no way imply access to all of the resources and services of the network. Voice telephony will certainly be one of the offerings; but improved voice is not why so many are promoting the NII. They expect the network to support a large smorgasbord of new information services, from high definition television to digital libraries.

These services will be layered on top of a complex physical communication infrastructure. In a sense, the physical data communication infrastructure can be thought of as a huge box of tinker toys that users and service providers will assemble together in a wide variety of information services. These services may be offered by the carriers, by the information industry (book publishers, newspapers and the like), by non-profit organizations, and by local, state and federal governments. Some services may be cooperatively purchased and operated by groups of users.

Many of these services, layered on top of the physical communication system, will, themselves, look like higher-level information networks. Examples abound on the current telephone facility. Modern automated teller machine networks, private corporate networks, and commercial services such as Prodigy and Compuserve are now in every sense of the word, "networks," even though they do not string their own wires around the country. Just as in the case of these current examples, many, if not most of these higher-level networks will be private-closed to general public access or available only at a price.

Universal service, to the extent it makes any sense at all in the NII context, must imply inexpensive and easy access by the public to at least some basic set of information resources and services, whether they are provided by the private marketplace, by government, or by non-profit entities of various kinds.

A century ago, the federal government encouraged development of the American West through several legislative acts, including the Homestead Act and the Agricultural Extension Act. (Our era is surely not the first time the government has seen fit to intervene directly in the private marketplace in the name of economic development.) In the Homestead Act it designated Federal land to private ownership and development. However, that law also required that certain tracts of land be dedicated to public use. Similarly, in the Agricultural Extension Act, the Federal government created institutions, the land-grant colleges, to conduct research and to provide for a free flow of useful information to the agricultural community.

Thus, systems of public institutions were created to accompany a private sector oriented infrastructure development.

The two-hundred-year history of infrastructure building in this country is replete with such pragmatic bargains. We turn to the commercial marketplace as the engine of investment and economic growth, but a concomitant recognition of public interest is extracted in return. Intellectual property law is an example. The system of copyright and patent protections called for in the U.S. Constitution were designed as such a bargain. A set of limited information property rights were established specifically to encourage greater public access to information, arts, and invention.

NREN as a Confederation

If the above argument is correct, then NREN as a monolithic government-funded network, a concept many saw imbedded in the 1991 HPCC Act, may never exist. Rather, NREN will be contained within a loose, but interconnected, confederation of public interest networks. Many of these specialized networks are starting to appear in early stages: so-called "freenets" serving local communities, special interest bulletin boards on the Internet, library networks and educational services, state government networks, and regional and national cooperative non-profit networks serving educational and research users. The information and telecommunication industries will also find markets within this mixture of public service networks, although for the private sector, the most profitable information markets will likely remain in the areas of mass entertainment and business information.

The United States has numerous examples in which publicly funded or partially subsidized activities coexist in a politically uneasy but manageable relationship with the private sector. Public transportation, government publishing, public schools, public libraries, parcel post, and public broadcasting are all models of direct government activities. In many other cases, non-profit private institutions-theaters, schools, libraries, research organizations, and the like-that provide public services receive subsidies in the form of tax exemption.

Similarly, there is a need for one or more national institutions to coordinate and support the development of public interest networks. Such institutions could play several roles:

- Contracting and managing the collective purchase of commercial services for its user community
- Encouraging and assisting the development of local community computing networks
- Developing new public service applications in areas such as education, health, and public information
- Establishing higher-level interconnection and interface protocols and standards
- Assisting users through education, training, and consulting programs
- Serving as a national voice for public interest networking in the ongoing communications policy debate.

Government funding is certainly appropriate, even necessary, to support certain functions such as applications development and user education; however, these institutions would also need to have significant private support. They need to be insulated from undue political interference. More importantly, serious first amendment issues could arise were the federal government too substantively close to the operation and management of public information networks. With some few exceptions, it is generally none of the government's business what citizens say to each other or do on such networks.

What Should Be the Governmental Role?

The "why" of government interest in promoting public interest networking is clear. Many public sector, government-supported services such as education, public information, R&D, public health, and distribution of financial benefits such as social security, Medicare, or welfare are, basically, information activities. They will benefit greatly from, if not absolutely require, access to the wide array of state of the art communication and information technology that will be part of a new NII. Use of new technology could not only improve service but provide efficiencies and operational savings. Thus, governments at all levels need to see that the NII grows in such a way as to be accessible for these purposes.

More broadly, the potential contribution of a new fundamental communications medium to our social and economic well-being are such that the nation needs to assure that two diverse public interests are protected:

1. The need for broad public access to the dominant knowledge and communication streams in our society.
2. The right of individuals to enjoy privacy in their communications and to freely contract among themselves for the sale or exchange of information goods and services.

These goals may seem to conflict. Public distribution of information competes with the private marketplace, for example. However, there is no reason why both interests cannot be accommodated on the NII. In a town, for example, private lands adjoin public parks. A walk around a city of any size brings one past a library, a bookstore, and a religious reading room handing out free information, and a government publication outlet. All, in a sense, compete with one another. On the other hand, all are necessary for a free, literate, democratic society.

History of technology shows us that a complex relationship can exist between public policy and invention, with no simple distinctions between public and private responsibility in exploiting technology and publicizing its use.

For example, in his book, *The Discoverers* (Random House, 1983), Daniel Boorstine contrasts the evolution of the clock and its enormous impact on western culture with its minimal impact in the East. So fundamental was this invention to European thought that Boorstine refers to it as the "Mother of machines" (a term coined, we should note, before the Gulf War).

In Europe, the clock underlays the basic transformation of medieval society, the Renaissance, the birth of science, and, eventually, the start of industrial revolution. It became the basic metaphor of the universe to astronomers. It brought order to medieval life. Every town had its church steeple or town hall with the large clock telling everyone the hours.

> No self-respecting European town would be without its public clock, which tolled all citizens together to defend, to celebrate, to mourn. A community that could focus its resources in a dazzling public clock was that much more of a community. The bell tolled for all and each, as the poet John Donne noted in 1623, and the tolling of the community's bells was a reminder that "I am involved in humanity." [p 73]

In the Orient, clocks remained the expensive private toys of the aristocracy and, thus, had little affect on society. In fact, some aspects of clocks were held as state secrets, the sole preserve of the emperor.

The adoption of the clock as a "public technology" in the West went hand in hand with their widespread public use, which, in turn stimulated development of a industry and broad marketplace for timepieces.

> In due course, each citizen wanted his own private clocks — first, for his household, then for his person. When more people had their private timepieces, more other people needed timepieces to fulfill their neighbor's expectations at worship, at work, and at play. [p 73]

The Bargain

The political bargain necessary to preserve public interest in a new NII seems straightforward.

1. Public interest networks (PINs) will need the digital infrastructure that can be built and managed only by private communications companies.
2. The communications companies need some assurance of return before they make the massive investments necessary to build the NII. To get that assurance, they want some degree of market stability and they want to get into the higher-level information service business, where many experts think the real profits will be.

There would seem to be the seeds of a political bargain here, but some mutual suspicion makes it difficult. Stakeholder perceptions of their future roles differ. The PINs see themselves as consumers of telecommunication services and, in many cases, as the leading edge developers of new services and applications. The users they serve — schools, libraries, local government agencies, etc. — doubt that they will any time soon (if ever) be viewed as an attractive and lucrative market by private sector providers.

The companies, however, wishing to enter the information market, see these rapidly growing PINs as potential competitors, growing with the aid of government subsidy and distorting the marketplace for future services. They point to the exponential growth in Internet use, some of it corporate use, and ask where the boundaries are between public and private investments.

The Federal government is inevitably being drawn into the role of referee in this fight. The political stakes are high for a misstep on either side. Clearly, especially in the current political climate, government would be loathe to threaten private sector investment in the new infrastructure. On the other hand, government ought to be equally loathe to see a new NII develop without the appropriate universal information services that serve the broad public sector responsibilities of government and serve to equalize economic and social opportunity in our society.

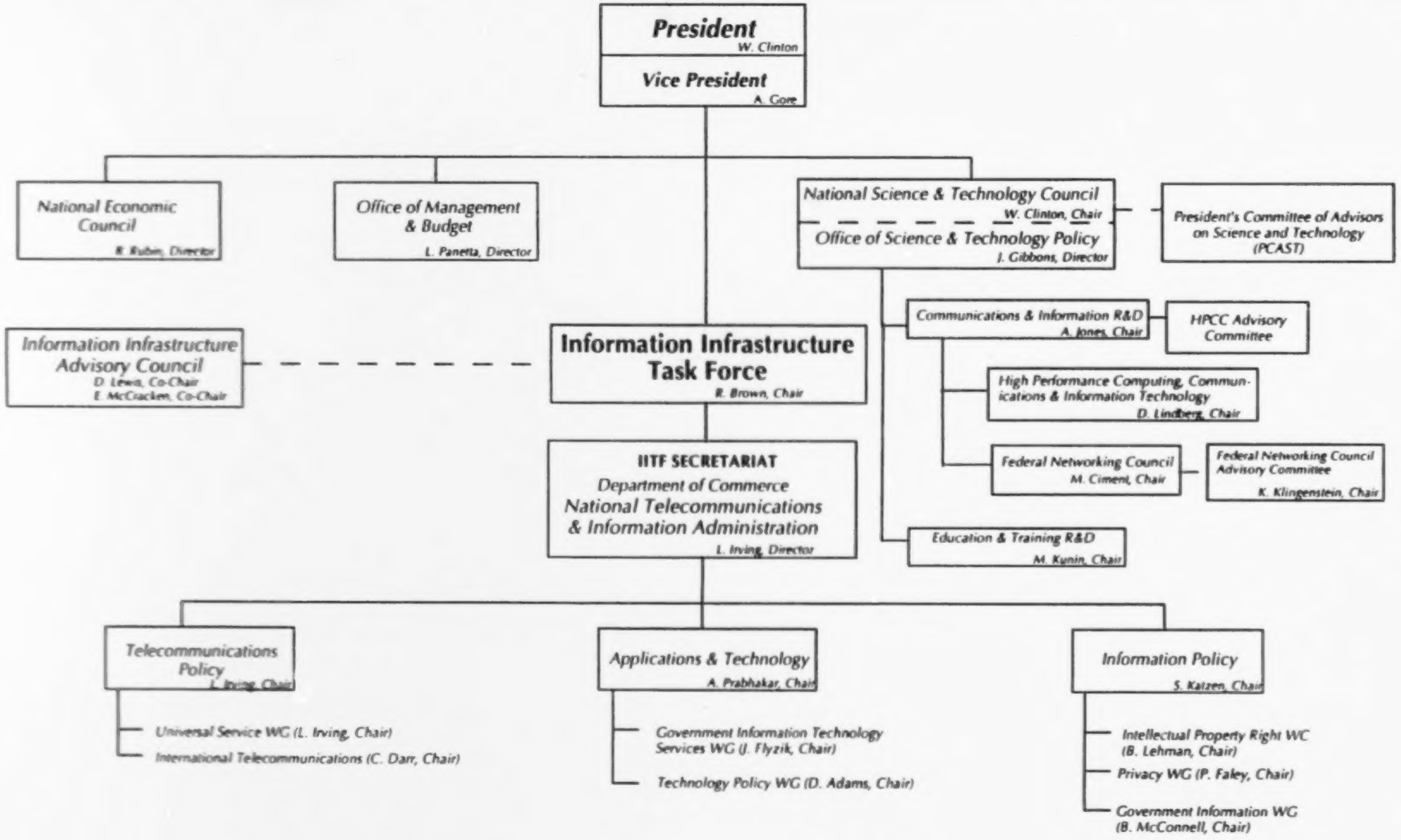
The current problem from the public interest perspective is that the threat to private sector investment is concrete, precise, and understandable. The second danger, inadequate attention to the public interest, is still hard to explain and justify, especially in an era where the driving political cliché is, "It's the economy, stupid!"

At the same time, the danger is no less real. The future quality of life in our society — economic, social and individual — will depend in part on the ability of all to participate into the dominant information flows of our society. We have always striven to keep barriers to access low.

Many know the familiar Emily Dickinson lines, "There is no frigate like a book." Fewer can cite the last lines of that poem:

> This traverse may the poorest take
>   Without oppress of toll;
> How frugal is the chariot
>   That bears the human soul.

ORGANIZATION OF U.S. NATIONAL INFORMATION INFRASTRUCTURE INITIATIVE


President
W. Clinton
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A. Gore
National Economic Council
R. Rubin, Director
Office of Management & Budget
L. Panetta, Director
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W. Clinton, Chair
Office of Science & Technology Policy
J. Gibbons, Director
President's Committee of Advisors on Science and Technology (PCAST)
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APPENDIX V

123rd ARL Membership Meeting

Ritz-Carlton Hotel, Pentagon City, VA

October 20-22, 1993

ATTENDANCE

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University of Alberta	Ernie Ingles
University of Arizona	Carla Stoffle
Arizona State University Library	Sherrie Schmidt
Auburn University Library	William Highfill
Boston University Library	Robert Hudson
Boston Public Library	Arthur Curley
Brigham Young University Library	Sterling Albrecht
University of British Columbia	Ruth Patrick
Brown University Library	Florence Doksansky
University of California, Berkeley	Dorothy Gregor
University of California Davis	Marilyn Sharrow
University of California-Irvine	Judith Paquette
University of California, Los Angeles	Gloria Werner
University of California Riverside	James Thompson
University of California-San Diego	Gerald Lowell
University of California-Santa Barbara	John Vasi
Canada Institute for Scientific & Technical Info.	Margot Montgomery
Case Western Reserve University Libraries	Kaye Gapen
Center for Research Libraries	Donald Simpson
University of Chicago Library	Martin Runkle
University of Cincinnati	David Kohl
University of Colorado Libraries	James Williams
Colorado State University	Joan Chambers
Columbia University Libraries	Elaine Sloan
University of Connecticut	[not represented]
Cornell University Libraries	Alain Seznec
Dartmouth College Libraries	Margaret Otto
University of Delaware	Susan Brynteson
Duke University Libraries	Jerry Campbell
Emory University Library	Joan Gotwals
University of Florida	Dale Canelas
Florida State University	Charles Miller
Georgetown University Library	Susan Martin
University of Georgia	William Potter
Georgia Institute of Technology	[not represented]

Member Institution	Represented by
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Harvard University Library	Richard De Gennaro
University of Hawaii	John Haak
University of Houston Libraries	Robin Downes
Howard University Libraries	Ann Randall
University of Illinois at Chicago	Sharon Hogan
University of Illinois at Urbana	Robert Wedgeworth
Indiana University Libraries	James Neal
University of Iowa Libraries	Larry Woods
Iowa State University Library	Nancy Eaton
Johns Hopkins University Library	Scott Bennett
University of Kansas Libraries	William Crowe
Kent State University Libraries	Don Tolliver
University of Kentucky Libraries	[not represented]
Laval University Library	Claude Bonnelly
Library of Congress	Winston Tabb
Linda Hall Library	Lee Jones
Louisiana State University Library	Jennifer Cargill
McGill University Library	Eric Ormsby
McMaster University Library	Graham Hill
The University of Manitoba	Carolynne Presser
University of Maryland Libraries	Joanne Harrar
University of Massachusetts Libraries	Richard Talbot
Massachusetts Institute of Technology Libraries	Jay Lucker
University of Miami Library	Frank Rodgers
University of Michigan Library	William Gosling
Michigan State University Library	Hiram Davis
University of Minnesota Libraries	Tom Shaughnessy
University of Missouri Library	Martha Alexander
National Agricultural Library	Joseph Howard
National Library of Canada	Marianne Scott
National Library of Medicine	Lois Ann Colaianni
University of Nebraska-Lincoln	Kent Hendrickson
University of New Mexico	[not represented]
New York Public Library	Paul Fasana
New York State Library	Jerome Yavarkovsky
New York University Libraries	[not represented]
University of North Carolina Library	Joe Hewitt
North Carolina State University	Susan Nutter
Northwestern University Libraries	David Bishop
University of Notre Dame Libraries	Maureen Gleason
Ohio State University Libraries	William Studer
University of Oklahoma	Sul Lee
Oklahoma State University	Edward Johnson
University of Oregon Library	George Shipman
University of Pennsylvania Libraries	Paul Mosher
Pennsylvania State University Library	Nancy Cline
University of Pittsburgh Libraries	Paul Kobulnicky
Princeton University Libraries	Nancy Klath
Purdue University Library	Emily Mobley
Queen's University Library	Paul Wiens
Rice University Library	Beth Shapiro

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University of Saskatchewan	Frank Winter
Smithsonian Institution Libraries	Barbara Smith
University of South Carolina	Homer Walton
University of Southern California	Peter Lyman
Southern Illinois University Library	Carolyn Snyder
Stanford University Libraries	Michael Keller
State University of New York at Albany	Meredith Butler
State University of New York at Buffalo	Barbara von Wahlde
State University at New York at Stony Brook	John Smith
Syracuse University Library	David Stam
Temple University Library	James Myers
University of Tennessee Libraries	Paula Kaufman
University of Texas Libraries	Harold Billings
Texas A&M University Library	Fred Heath
University of Toronto Libraries	Carole Moore
Tulane University Library	Phil Leinbach
University of Utah Libraries	[not represented]
Vanderbilt University Library	[not represented]
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Virginia Polytechnic Inst. & State University	Joanne Eustis
University of Washington Libraries	Betty Bengtson
Washington State University Libraries	Nancy Baker
Washington University Libraries	Shirley Baker
University of Waterloo	Murray Shepherd
Wayne State University Libraries	Peter Spyers-Duran
University of Western Ontario	[not represented]
University of Wisconsin Libraries	Kenneth Frazier
Yale University Libraries	Millicent Abell
York University Libraries	Ellen Hoffmann

Speakers and Guests	Represented by
Andrew W. Mellon Foundation	Richard Ekman
Association of American Universities	John Vaughn
Bellcore	Thomas Spacek
University of California	Richard West
University of Illinois–Chicago	Nancy Johns
Chronicle of Higher Education	Judith Turner
Commission on Preservation and Access	Patricia Battin
Computer Systems Policy Project	Kenneth Kay
Computing Research Association	Frederick Weingarten
University of Connecticut	Jan Merrill-Oldham
Council on Library Resources	Julia Blixrud
Council on Library Resources	Martin Cummings
Council on Library Resources	David Penniman
University of Delaware	Ferris Webster
Department of Education	Ray Fry

Speakers and Guests	Represented by
EDUCOM	Robert Heterick, Jr.
ESRI	Charlie Fitzpatrick
Harvard University	Brian Kahin
Industry and Science Canada	Jocelyn Ghent Mallett
Library of Congress	Diane Kresh
Library of Congress	William Sittig
Library of Congress	Sarah Thomas
University of Massachusetts	Gordon Fretwell
University of Michigan	John D'Arms
University of Minnesota Press	Lisa Freeman
National Archives & Records Administration	Lisa Weber
National Coalition on Black Voter Participation	Sonia Javis
National Endowment for the Humanities	George Farr
University of North Carolina	Laura Gasaway
OCLC, Inc.	Wayne Smith
Office of Science and Technology Policy	Michael Nelson
Pennsylvania State University	Richard Taylor
Research Libraries Group	James Michalko
Universities Space Research Association	Kathleen Eisenbeis
Squire, Sanders and Dempsey	Susan Weller
Stanford University	Robert Street
State of North Carolina	Jane Smith Patterson
University of Virginia	Kendon Stubbs
University of Virginia	John Price-Wilkin
University of Virginia	David Seaman
University of Virginia	Paul Bergen
University of Wisconsin	Henry Barschall
Wilson Library Bulletin	GraceAnne DeCandido

ARL Staff

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Jackson, Mary	ARL Visiting Program Officer
Jennings, Kriza	OMS Diversity Consultant
Jurow, Susan	Assistant Executive Director for Admin. and Director, OMS
Lippincott, Joan	Associate Executive Director, Coalition for Networked Information
Okerson, Ann	Director, Office of Scientific and Academic Publishing
Peters, Paul	Executive Director, Coalition for Networked Information
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